50 years

A reader on ekistics
Thirty years after C.A. Doxiadis

The Athens Technological Organization (ATO)

The Athens Technological Organization (ATO) is a non-profit organization established in 1958, to further technology and scientific research on any subject which can contribute to the improvement of human living conditions, technical and economic development and the training of people capable of pursuing these purposes.

Athens Center of Ekistics (ACE)

Upon its establishment in 1958, ATO started ekistic research and educational programs and later on in 1963 established the Athens Center of Ekistics (ACE) to foster a concerted program of research, education, documentation, and international cooperation related to the art and science concerned with the development of human settlements. In the domain of documentation in addition to its library, ACE publishes the following two journals:

• Ekistics, the Problems and Science of Human Settlements, and
• The Ekistic Index of Periodicals, as well as
• A series of research reports and monographs documenting its following four major research projects:

– "The City of the Future"
– "The Capital of Greece"
– "The Human Community"
– "The Ancient Greek Cities"

Since 1965 ATO-ACE have hosted on their premises the Headquarters and Secretariat of the World Society for Ekistics (WSE), an independent organization, whose goals and objectives are compatible with those of ACE.

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World Society for Ekistics (WSE)

The Society – an international nongovernmental organization (NGO) in consultative status with the United Nations (ECOSOC) – is a nonpolitical and nonreligious body with limited membership, formed to study man's patterns of living and their physical expression in the past, present, and future. The aims and objectives of the Society are:

• To promote the development of knowledge and ideas concerning human settlements by research and through publications, conferences, etc.;
• To encourage the development and expansion of education in ekistics;
• To educate public opinion concerning ekistics, thus stimulating worldwide interest and cooperation;
• To recognize the benefits and the necessity of an interdisciplinary approach to the needs of human settlements, and to promote and emphasize such an approach.

EKISTICS

ΟΙΚΙΣΤΙΚΗ

the problems and science of
HUMAN
SETTLEMENTS

Guest-editor: Miloš R. Perović

A reader on ekistics
Thirty years after C.A. Doxiadis

A reader on ekistics, thirty years after C.A. Doxiadis

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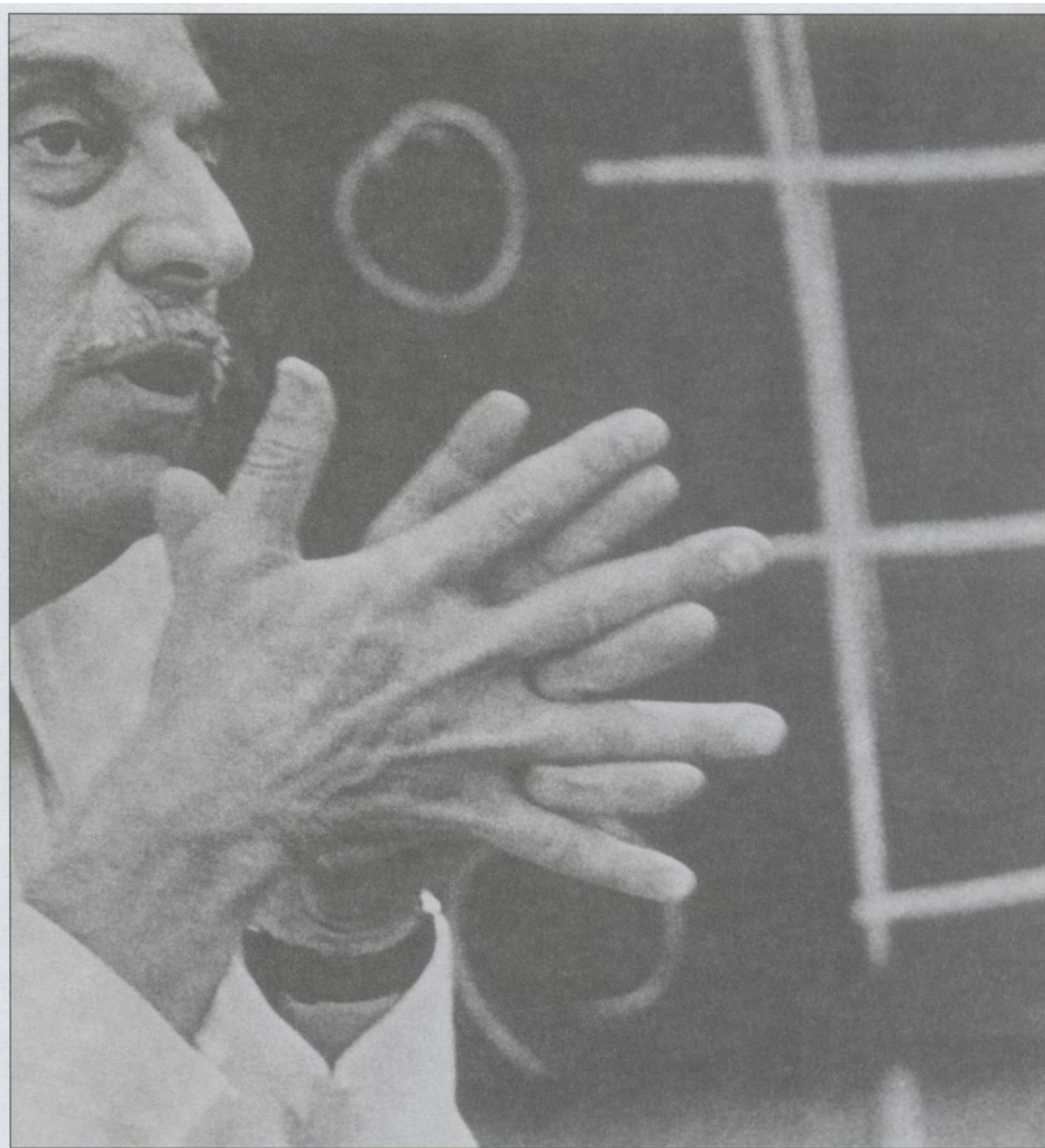
C.A. Doxiadis in a discussion with American clients. (*Source:* C.A. Doxiadis Archives, © Constantinos and Emma Doxiadis Foundation).

The editor's page

● We have come to the end of a very difficult period and we are happy that we have managed to enter the sixth decade of the publication of *Ekistics* with hopes for a better future.

● We dedicate this volume to the memory of Constantinos A. Doxiadis, founder of the journal, thirty years after his death on 28 June, 1975.

● Our theme, "A reader on ekistics," is in fact "A C.A. Doxiadis reader." The volume contains selected texts from Doxiadis' extended writings. *Ekistics* has never published a Doxiadis reader except for a special issue a year after his death entitled "C.A. Doxiadis 1913-75, Pursuit of an Attainable Ideal" (June 1976, no. 247) devoted entirely to him with very brief extracts from some of his writings and other writings about him by friends and colleagues of his the world over.

● It gives us pleasure to have as guest-editor for this volume Dr Miloš R. Perović, Professor of History of Modern Architecture, Faculty of Architecture, University of Belgrade, whom we first met as a young graduate student of C.A. Doxiadis in 1969 at the Athens Center of Ekistics, and whose collaboration and friendship we have enjoyed ever since.

P. Psomopoulos

Fig. 1: Miloš R. Perović, 1972, as a young architect, graduate student at the Athens Center of Ekistics.

Fig. 2: Dr Perović,Professor of History of Modern Architecture, University of Belgrade, in 2005.

Fig. 3: Top left: Miloš Perović as an observer in the ancient theater of Delos, the last session of the 1971 Delos Symposion. Front row: Delos participants Buckminster Fuller, Margaret Mead, Piet Hein, Mrs Fuller, Mrs Toynbee, Arnold J. Toynbee, Emma Doxiadis, C.A. Doxiadis and Eiichi Isomura.

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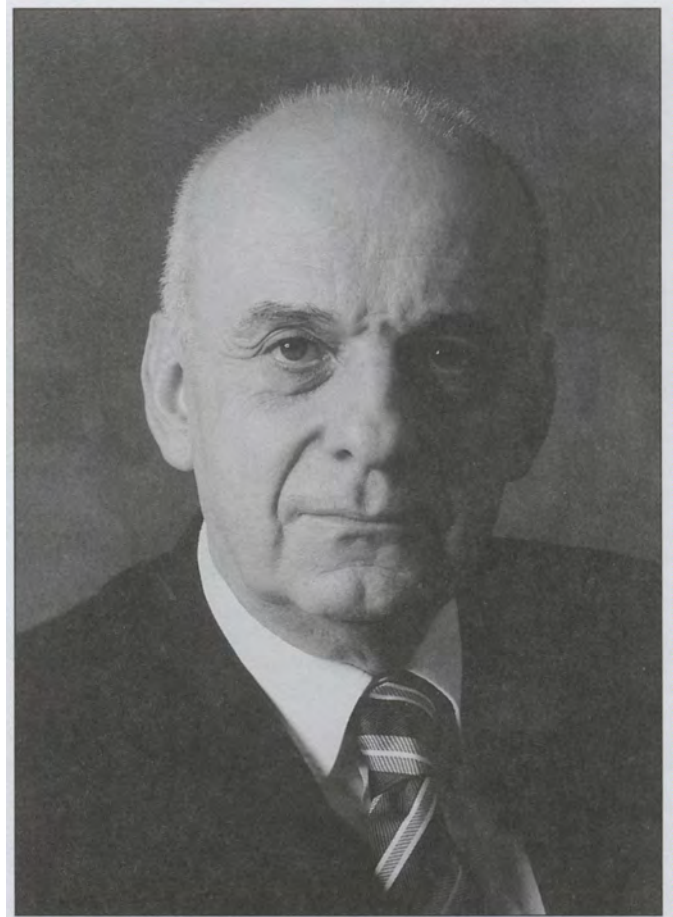
Miloš R. Perović, ekistics and *Ekistics*

The editor

In a brief note on his life and achievements made available to us by our guest-editor, Dr Miloš R. Perović, one can read that he is currently Professor of History of Modern Architecture at the Faculty of Architecture, University of Belgrade.

Furthermore, he notes that he obtained his M.Sc in architecture and town-planning in Belgrade and at the Athens Center of Ekistics, Athens, Greece, and his Ph.D at the Faculty of Architecture, University of Belgrade.

His many writings include *Computer Atlas of Belgrade* (Belgrade, 1976, second edition in Serbian and English as Research into the Urban Structure of Belgrade, Belgrade, 2002); *Dialogues with the Delians* (Ljubljana, 1978, in Slovenian and English); *Anthropos and Polis: Selected Texts by Constantinos A. Doxiadis* (Belgrade, 1982, in Serbian); *Lessons of the Past* (Belgrade, 1985, in Serbian and English, 2nd ed., 2000, 3rd ed. forthcoming); four volumes on the history of modern architecture in the world 1750 to present; *Serbian 20th Century Architecture: From Historicism to Second Modernism* (Belgrade, 2003); and numerous articles published in scientific and professional journals.

He has had one-man exhibitions of his experimental town-planning projects in Ljubljana (1977), Zagreb (1978), Belgrade (1978), Paris (1981), Dublin (1981), and at the Gallery of the Royal Institute of British Architects in London (1986).

He has lectured at New York University, the Institute of Fine Arts (New York), Princeton University, Columbia University (New York), Ohio State University (Columbus), Athens Center of Ekistics, University of Cambridge (UK), and the Royal Institute of British Architects.

No doubt this impressive career promises much more in the years to come.

*

However, there are important aspects in Miloš R. Perović's long and creative life that I would like to stress, particularly concerning his uninterrupted involvement in the overall effort of ekistics for the last 35 years.

● To start with, in my capacity first as Acting Editor and thereafter as Editor of *Ekistics* for the last 30 years, I believe that Dr Miloš is the only recipient of the journal who is its most systematic reader. I have constantly been grateful for his remarks and comments on the contents of each issue: some praising, some critical and some even nastily witty but always welcome as I never doubted his good intentions and never ceased to enjoy his characteristically charming sense of humor.

● Miloš has not limited himself to the direct experience of the effort of ekistics as a student at the Graduate School of Ekistics or as a research fellow at the Athens Center of Ekistics. He has been avidly reading and collecting documents which had been produced long before his years in Athens and continues to do

so up to the present day. I must admit that even I myself consult him in the rare case when a certain reference proves difficult to be located.

● Miloš has made every possible effort and has taken advantage of every opportunity to make his support of the overall ekistic approach known to the widest possible public. In this sense, he is one of the few members of the World Society for Ekistics who have individually and enthusiastically contributed to the fulfillment of the Society's goals in

• promoting the development of knowledge and ideas concerning human settlements by research and through publications, conferences, etc.;
• encouraging the development and expansion of education in ekistics;
• educating public opinion concerning ekistics, thus stimulating worldwide interest and cooperation;
• recognizing the benefits and the necessity of an interdisciplinary approach to the needs of human settlements.

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Before closing, I would like to refer to two of his publications which are directly related to ekistics and C.A. Doxiadis:

● The first book, *Anthropos and Polis*, initially published in Serbian in 1982, is the basis for the C.A. Doxiadis Reader in the present volume of the journal, which consists of a selection of writings by C.A. Doxiadis with an orientation towards planning practice. For more on this, readers should refer to pages 28 and 29, and of course to pages 31 to 211.

● The second book, *Dialogues with the Delians*, reflects Miloš R. Perović's involvement and interest in other activities of the Athens Center of Ekistics of the Athens Technological Organization and the World Society for Ekistics. It actually contains a selection of interviews with personalities of international repute, who took part in one or more of the Delos Symposia between 1963 and 1972, such as Constantinos A. Doxiadis, René Dubos, Richard Buckminster Fuller, Jean Gottmann, Eiichi Isomura, Margaret Mead, Jérome Monod, John Papaioannou, Arnold J. Toynbee and Jaqueline Tyrwhitt. But in addition to these interviews, the book also contains the final reports or "Declarations" of all 10 Delos Symposia.

Hereunder I am pleased to reproduce, without Dr Perović's permission – for which I hope he will forgive me – pages 5 to 8 of his Introduction to the book *Dialogues with the Delians* which was printed in 1978 from interviews that were first published in Slovenian by *Sinteza* journal with Stane Bernik, Art Historian and Social Scientist, as Editor.

★★★

In his introduction to José Luis Sert's personal interpretation
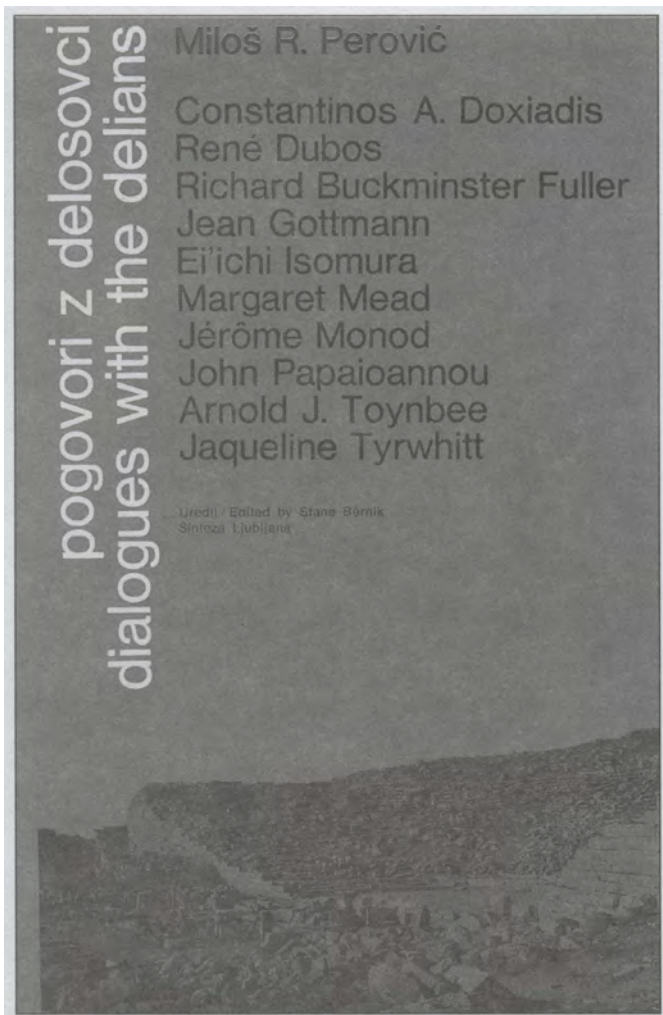
Fig. 4: The cover of Miloš Perović's book *Dialogues with the Delians* in Slovenian and English (Ljubljana, 1978).

Fig. 5: R. Buckminster Fuller interviewed by Miloš Perović in the ancient theater on the island of Delos, 1971.
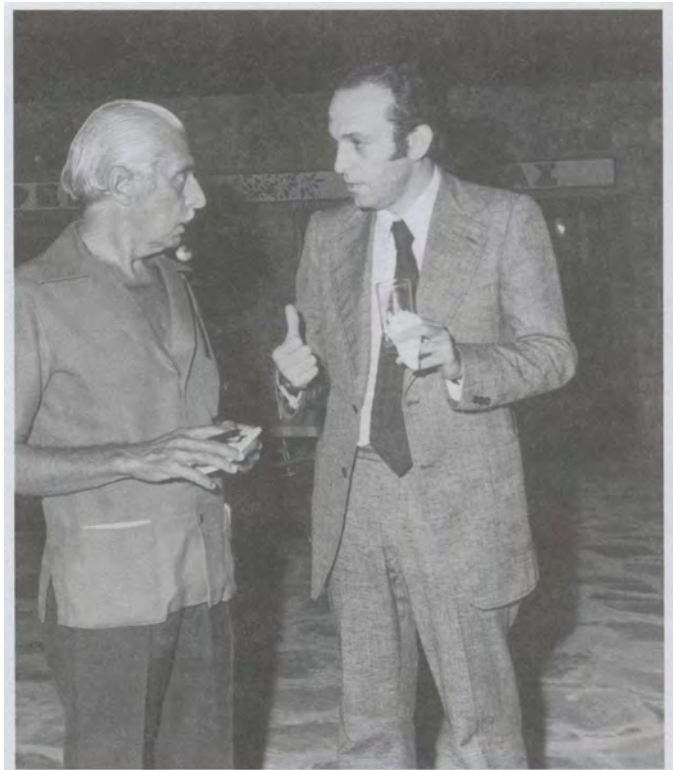
Fig. 6: C.A. Doxiadis in a discussion with Miloš Perović at the Apollonion, Porto Rafti, 1972.

of the Fourth CIAM Congress "Can our Cities Survive?" Sigfried Giedion, at that time Secretary of the CIAM, wrote:

"In 1933 it was agreed to hold the Fourth Congress, which was to deal with 'The Functional City', on board the steamship Patris II en route from Marseilles to Athens and return. Through the help of friends, this Greek steamer was placed at our disposal, and we hoped that the quiet Mediterranean would afford us three weeks of concentrated work. And, indeed, it turned out to be the most inspired of all congresses. Our assemblies were held on the promenade of the Patris II. Although not all participated in the discussions, the presence of musicians, poets, authors, and painters helped to keep the spirit of these discussions from being a closed and specialized one."

This, "the most inspired of all congresses", ended by bringing out "La Charte d'Athènes", a document which had a strong influence on modern architecture and town planning.

In 1963 on board another ship, Professor Giedion, as a participant at the first Delos Symposion, wrote:

"What great changes have occurred within a generation. I now see around me high officials and presidents grappling with the same problems that bothered us trying to break through the mist of future developments and foresee its aims and trends. This represents a fundamental change in the attitude of responsible decision makers which is of utmost importance for the development of our period."

The series of Delos Symposia started on the thirtieth anniversary of "La Charte d'Athènes" and were organized by the Athens Technological Institute and the Athens Center of Ekistics, as was stated in the First Delos Declaration, in order:

- to establish in its own right a new discipline of human settlements;
- to initiate basic research of the most far-reaching kind;
- to bring together specialists from other relevant disciplines to work together on projects in this field;
- to work out new methods of training the men who can assume

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leadership and responsibility in the sphere of action;
- to attract some of the best young minds into this new area of research, development and practice.

The host was Constantinos A. Doxiadis, a scientist with great international planning experience and a high reputation, and founder of Ekistics – "the science of human settlements."

In his view a completely new approach was needed to produce an awareness of the basic natural, historical, economic, sociological, anthropological and ecological features of cities.

Doxiadis defined the five elements of ekistics as Nature, the earth and the natural sites of human settlements; Anthropos who creates and inhabits them; Society, which is formed mainly in them; Networks, the links which enable them to survive and grow; and Shells, the structures which transform Nature and house the previous three elements. It is the relationship between the elements which forms human settlements.

The first Delos Symposion, consisting of thirty-four participants from academic and professional life, gathered on board m/v "New Hellas" for a week-long, tightly packed series of scientific discussions and arguments. These were followed by friendly, relaxed chats in the afternoons, study tours of classical sites and pleasant whitewashed villages on the Aegean Islands. Late every evening, after dinner, the Delians were given presentations by the most distinguished members of the group on specific topics, in one of the lounges of the ship. The cruise ended at the island of Delos, the birthplace of Apollo, God of light and enlightenment, where in the ancient theater the final document from the meetings, The Declaration, was read.

By the end of the week all the participants felt that the meeting had been extremely valuable in bringing together the views of people from a very wide range of countries, disciplines and sciences. They also concluded that a second Symposion should be held the following year.

In 1964 the Delians accepted Doxiadis' view that their concern should be not only cities and villages, but all types of human settlements and that this should be recognized within the United Nations as a separate sector of activity. This goal was attained in 1972 with the UN Conference on the Environment held in Stockholm and four years later at the second UN Conference on Human Settlements held in Vancouver.

In 1965 attention was concentrated on the problems of people living in high density areas, in 1966 on the nature of human settlements, and in 1967 on the definition of a strategy for development at all scales progressing from the single room to the human community, the town, the city, the urbanized region and the world.

Delos '67 marked a turning point. What was started as meetings of distinguished personalities and widely recognized authorities in fields relating to human settlements, became now a well structured series of Symposia devoted to the basic elements of human settlements.

Thus, in 1968 the subject was Anthropos in his Settlements, in 1969 Society and Human Settlements, in 1970 attention was turned to Networks, in 1971 to Buildings and Human Settlements, and finally in 1972 to the Synthesis of the Ekistic elements and the ways by which the experience of the past could be used in the decisions to be taken for the future.

The Delos group was always kept small and exclusive. In the ten years up to 1972 not many more than two hundred par-

ticipants were invited to take part in one or more meetings. However the group remained extremely influential. Its power came from names such as Walter Christaller, C.A. Doxiadis, René Dubos, Erik Erikson, R. Buckminster Fuller, Sigfried Giedion, Jean Gottmann, Bertrand de Jouvenel, Herman Kahn, Gyorgy Kepes, J. Marshall McLuhan, Margaret Mead, Jonas Salk, Vikram Sarabhai, Olga Smirnova, Kenzo Tange, Arnold Toynbee, Barbara Ward, etc. who patiently worked towards the better understanding of human settlements, and who managed to contribute significantly to the marked changes that have taken place in the process of analysis and planning of human settlements during the last decade.

In order to broaden the platform for contacts and exchanges of views and ideas of those who had been to Delos and the others interested in Ekistics, the World Society for Ekistics was established in 1965, in accordance with decisions taken during the first two Delos Symposia. The Society has an international membership drawn from all disciplines and sciences which contribute to Ekistics under the Presidency, first of Lord Richard Llewelyn-Davis, later of Margaret Mead, Jean Gottmann, Eiichi Isomura and at present of R. Buckminster Fuller.

The choice of contributors in the present volume, the Delians to be interviewed, does not follow any particular rule. They are simply close friends of the author, who attended the last three Delos Symposia as an observer, willing to participate in an experiment designed to show both the latest interests and results of research of some members of the group, within the framework set by the Delos Symposia, and certain connections and similarities in views that have been formed after so many years of fruitful exchanges and confrontations of ideas. The interviews were carried out in the period 1971-75 during the last two Delos Symposia, and, during the World Society for Ekistics preparatory meetings for the Vancouver UN Conference on Human Settlements, and were first published in *Sinteza* journal under the general title "Dialogues with the Delians".

The Declaration of the last Delos Symposion (1972), read by Margaret Mead in the torch-lit darkness of the Delos night, contains these prophetic lines:

"The crisis in world settlements persists and increases. The speed of urbanization continues to accelerate. With man's burgeoning settlements, the need for human dignity, for full participation by the citizen in the community, for the recovery or creation of neighborhood, for variety, for mobility, has grown steadily more apparent ... The next two or three decades will be critical in the race between increasing numbers and available resources, between the rising social tensions and the inventions of new kinds of community" ... which define the Promethean task in front of the World Society for Ekistics and the new generation of Delos Symposia to come.

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In view of all the above, I hope readers will understand why, for the first time in the history of the journal, I have taken it upon myself to write this extension of the Editor's Page, focusing on the Guest-editor.

C o n s t a n t i n o s   A .   D o x i a d i s

Born
1913
Constantinos A. Doxiadis, son of Apostolos and Evanthia (Mezeviri) Doxiadis, comes from a family that played an important role in the settlement of Greek war refugees in between the two World Wars. His father, a pediatrician, was Minister for the Resettlement of Refugees, Social Welfare and Public Health and organized many welfare services especially for children.

Graduated
Architect-Engineer from the Technical University of Athens in 1935, did graduate work at Berlin-Charlottenburg University and received the degree of Dr. Ing. «Mit Auszeichnung» 1936.

Military
Service
- Corporal, Artillery of the Greek Army (1940-1941).
- Chief of the National Resistance Group «Hephaestus» (1941 - 1945).
- Captain in the Greek Army at the time of Greece's liberation (1944 - 1945).

Married
Emma Scheepers, April 30, 1940; children: Evanthia, Calliope, Euphrosyne, Apostolos.

Died
June 28, 1975, after a long period of illness

Honorary
Degrees
- Swarthmore College Pa., U.S.A., 1962 (LL. D.)
- Wayne State University, Mich., U.S.A., 1964 (D.H.)
- Mills College, Calif., U.S.A., 1964 (LL.D.)
- N. Michigan University, Mich., U.S.A. 1965 (L.H.D.)
- Detroit Institute of Technology, Mich., U.S.A. 1966 (D.Sc.)
- University of Rhode Island, R.I., U.S.A., 1966 (D.F.A.)
- University of Pittsburgh, Pa., U.S.A., 1967 (D.Sc.)
- The University of Michigan, Mich., U.S.A., 1967 (LL.D.)
- Tulane University, La., U.S.A., 1968 (LL.D.)
- Kalamazoo College, Mich., U.S.A., 1968 (LL.D.)
- Marietta College, Ohio, U.S.A., 1969 (D.Sc.)
- Case Western Reserve University, Ohio, U.S.A., 1969 (L.H.D.).

Worked
- Chief Town Planning Officer, Greater Athens Area (1937 - 1938).
- Head, Department of Regional and Town Planning, Ministry of Public Works, Greece (1939 - 1945).

Taught
- Lecturer and Acting Professor of Town Planning, Technical University of Athens (1939 - 1943).
- Visiting Lecturer at the Universities of Chicago, Dublin, Harvard, Michigan, New York, Oxford, Princeton, Yale, Massachusetts and Georgia Institutes of Technology, Swarthmore and Trinity Colleges.
- Professor of Ekistics at the Athens Center of Ekistics, Athens Technological Organization.

Served
- Under-Secretary and Director General of the Ministry of Housing and Reconstruction, Greece (1945 - 1948).
- Minister - Coordinator of the Greek Recovery Program and Under-Secretary, Ministry of Coordination (1948 - 1951).

Participated
- Member of the Greek Delegation, San Francisco Peace Conference (1945).
- Representative of Greece to France, England and the United States of America on the problems of postwar reconstruction (1945).
- Head of the Greek Delegation at the U.N. International Conference on Housing, Planning and Reconstruction (1947).
- Head of the Greek Delegation at the Greco-Italian War Reparation Conference (1949 - 1950).
- Representative of Greece on the Housing, Building and Planning Committee of the Economic and Social Council of the United Nations, New York (1963 and 1964).
- Chairman of the Session on Urban Problems, United Nations Conference on the Application of Science and Technology for the benefit of the less developed areas, Geneva (1963).

Consultant
- United Nations (Asian Highway; Housing in India and Algeria; Housing and Planning in Skopje, Yugoslavia).
- Food and Agriculture Organization of the United Nations (Land and Water Use Survey, Kordofan, Sudan).
- International Bank for Reconstruction and Development (Housing in Jordan, Syria and Venezuela).
- Inter-American Development Bank (Development of the River Plate Basin).
- International Cooperation Administration (Housing in Lebanon).
- Agency for International Development (Housing in Karachi and Saigon).
- Ford Foundation (Pilot Housing, Ekistic Training and Educational Buildings in Pakistan, Lebanon, and Syria; Housing in Chile).
- Redevelopment Land Agency of Washington D.C. (Urban Renewal, Washington D.C.).
- Governments of: Brazil, Cyprus, Ethiopia, France, Ghana, Greece, India, Iran, Iraq, Jordan, Lebanon, Libya, Pakistan, Saudi Arabia, S. Vietnam, Spain, the Sudan, Syria, the United States, Zambia.

Researcher
- «City of the Future», «Human Community», «The Ancient Greek City» and «The Capital of Greece», projects of the Athens Technological Organization.
- National Association of Housing and Redevelopment Officials (NAHRO) on Urban Renewal in the U.S.A.

Elected	● Corresponding Member, Deutsche Akademie für Städtebau und Landesplanung (1937).
	● Honorary Corresponding Member, Town Planning Institute of Great Britain (1947).
	● Chairman, United Nations Working Group on Housing Policies, Geneva (1948).
	● Honorary Corresponding Fellow of the Royal Incorporation of Architects in Scotland, Glasgow (1964)
	● Member of the International Committee, The Institute on Man and Science, New York (1965).
	● Honorary Member, Industrial Designers Society of America (1970).
	● President, Doxiadis Associates Int., Consultants on Development and Ekistics, Athens, Greece, and of the various affiliated companies abroad (1951 - 1975).
	● Chairman, Board of Directors and Chief Executive Officer, Doxiadis Associates Inc., Washington D.C.
	● Chairman, Board of Directors, Doxiadis Urban Systems Inc., Washington D.C.
	● Chairman, Board of Directors, Athens Technological Organization, Athens, Greece.
	● President, Athens Center of Ekistics, Athens, Greece.
Awarded	● Sir Patrick Abercrombie Prize of the International Union of Architects (1963).
	● «Cali de Oro» (The Mexican Gold Medal) Award of the Society of Mexican Architects (1963).
	● Award of Excellence, Industrial Designers Society of America (1965).
	● Aspen Award for the Humanities (1966).
Decorated	● Greek Military Cross, for his services during the war 1940 - 1941 (1941).
	● Order of the British Empire, for his activities in the National Resistance and for his collaboration with the Allied Forces, Middle East (1945).
	● Order of Cedar, Lebanon, for his contribution to the development of Lebanon (1958).
	● Royal Order of the Phoenix, Greece, for his contribution to the development of Greece (1960).
	● Yugoslav Flag Order with Golden Wreath (1966).
Author of	● «Raumordnung im griechischen Städtebau» (1937).
	● «A Simple Story» (1945).
	● «Ekistic Analysis» (1946).
	● «Destruction of Towns and Villages in Greece» (1946).
	● «A Plan for the Survival of the Greek People» (prepared in cooperation with several collaborators), 2 volumes (1947).
	● «Ekistic Policies for the Reconstruction of the Country with a 20-year Program» (1947).
	● «Dodecanese» (prepared in cooperation with several scientists), 2 volumes (1947).
	● «March of the People» (1948).
	● «Our Capital and its Future» (a long-term policy and program for Athens) (1960).
	● «Architecture in Transition» (in English, French, German, Japanese, Portuguese, Spanish) (1963).
	● «The New World of Urban Man» (with T.B. Douglass) (1965).
	● «Urban Renewal and the Future of the American City» (1966).
	● «Between Dystopia and Utopia» (in English, Japanese and Spanish) (1966).
	● «Ekistics: An Introduction to the Science of Human Settlements» (1968).
	● «Emergence and Growth of an Urban Region, the Developing Urban Detroit Area», vol. 1 (1966); vol. 2 (1967); vol. 3 (1970). A project of the Detroit Edison Company, Wayne State University and Doxiadis Associates under the chairmanship of W.L. Cisler, Chairman of the Board, the Detroit Edison Company, directed by C.A. Doxiadis, and published by the Detroit Edison Company.
	● «Campus Planning in an Urban Area, A master plan for Rensselaer Polytechnic Institute», prepared by Doxiadis Associates, Praeger Publishers, Inc., New York, 1971.
	● «The Two-Headed Eagle, From the Past to the Future of Human Settlements», Lycabettus Press, Athens, 1972.
	● «Architectural Space in Ancient Greece», trs. by Jaqueline Tyrwhitt from the German original «Raumordnung im griechischen Städtebau», MIT Press, Cambridge, Mass., 1972.
	● «The Great Urban Crimes We Permit by Law», Lycabettus Press, Athens, 1973.
	● «Anthropopolis, City for Human Development», Athens Publishing Center, Athens, 1974.
	● «Ecumenopolis, the Inevitable City of the Future», in collaboration with J. Papaioannou, Athens Publishing Center, Athens, 1975.
	● «Building Entopia», Athens Publishing Center, Athens, 1975.
	● «Action for Human Settlements», Athens Publishing Center, Athens, 1976.
	● «Ecology and Ekistics» edited by Professor Gerald Dix, Published by Elek Books Ltd. London 1977
	● Numerous articles in Greek and international journals
Major Projects	● In the application of his theories on Ekistics, C.A. Doxiadis studied, programmed, planned and designed, in collaboration with his colleagues, a great number of human settlements and other development projects. These projects cover several fields, like rural settlements, agriculture and irrigation, industrial settlements, manufacturing, power and public works, commerce and tourism, transportation and communications, housing, urban renewal and development of new cities, etc.
	Some of the more significant projects are:
Brazil	● Plans and Programs for the Greater Rio de Janeiro (State of Guanabara).
Cyprus	● Tourist Development Studies and Master Plan for the city of Limassol.
Ethiopia	● Axum Cathedral.
France	● Development Study for the Mediterranean Region.
	● Sub-division of France into major program and development regions.
Ghana	● The new city of Tema for 500,000 people.
	● Plans and Programs for the Accra-Tema region.

Greece	● Tourist Development Studies for the Western Coast of Greece, and the Athens Coastline.
	● Master Programs and Plans for the island of Rhodes, Ioannina, Serres, and other cities.
	● Designs for the Pierce College Campus, in Aghia Paraskevi, and a 500-bed hotel in Thessaloniki.
	● New town of «Aspra Spitia».
Jordan	● Tourist Development Studies for the South Aqaba Coastline.
Iran	● Tourist Development Studies for the Caspian Coast.
Iraq	● National Housing Program.
	● Plans and Programs for Baghdad and other major cities.
Italy	● Tourist Development Study near Otranto.
Libya	● National Housing Program and National Transport Plan.
	● Regional Program and Plan for towns and villages of Cyrenaica.
	● Planning of Marsa el Bregah and the city of Beida.
Pakistan	● Plans and Programs for Islamabad, the new capital.
	● Greater Karachi Resettlement Program for 500,000 people.
	● New Campus for the University of Panjab, Lahore, and the Agricultural University of Lyallpur.
Saudi Arabia	● Plans and Programs for the capital city of Riyadh.
Spain	● Plans and Programs for the development of industrial poles in E. and W. Andalusia.
	● Tourist Development Studies for Andalusia and the eastern extension of the Costa del Sol.
	● Regional Plans for the province of Guipuzcoa and the island of Tenerife.
Sudan	● Plans and Programs for the Greater Khartoum and for Port Sudan.
	● Land and Water Use Survey for a 90,000 sq.km. savanna area in the Kordofan province.
Syria	● Master Plan of the University of Aleppo.
	● Plans and Programs for the cities of Hama, Homs and Selemiyah.
U.S.A.	● Research and Program for the Development of the Urban Detroit Area, in collaboration with Detroit Edison Company and Wayne State University.
	● Research study for the Great Lakes Megalopolis in collaboration with the Great Lakes Megalopolis Research Project, Inc.
	● Urban Renewal and Development Plans for Eastwick, in Philadelphia, Pa.; Louisville Riverfront, Ky.; Hampton Downtown, Va.; Georgetown Riverfront, Washington D.C.; Miami Downtown, Fla.; Downtown Columbia (S. Carolina).
Zambia	● Plans and Programs for Lusaka, Kafue and other cities.
	● Program for the resettlement of homeless people.
Other	● Survey of the Trans-Asian Highway linking the Middle East with South-East Asia.
	● African Transport Plan.
	● Programs for the development of the River Plate Basin involving Argentina, Bolivia, Brazil, Paraguay and Uruguay.
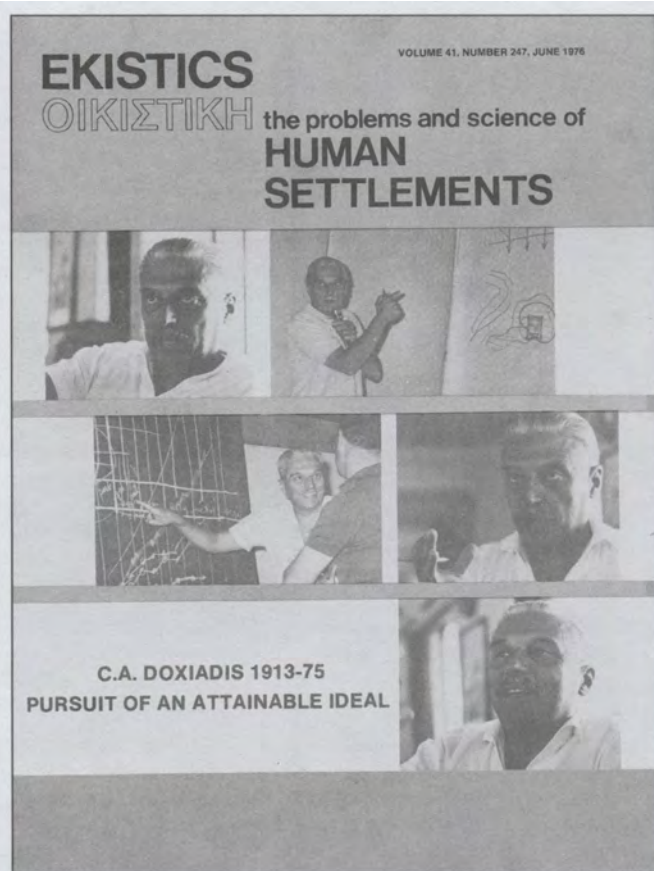
Photographs of C.A. Doxiadis on covers of back issues of *Ekistics* (a) on the 1972 Athens Ekistics Month and (b) on a 1976 issue, a first Doxiadis Reader, dedicated to him a year after his death.

C.A. Doxiadis' early career and the birth of ekistics

John G. Papaioannou

The development of the concept of ekistics in C.A. Doxiadis'
mind was a slow, gradual, but also tenacious, obstinate, and
eventually brilliantly successful process. Imaginative and
forceful, endowed with both a surprisingly clear view of the
most complex facets of human affairs and an admirable ca-
pacity for their simplification to the barest essentials, Doxiadis
was able to follow an almost straight and totally consistent path
throughout his career (starting at an early age). His main tar-
get was the formulation of the idea of ekistics as a new science
of human settlements, its development, enrichment, amplifi-
cation, refinement and, what seemed most important to him,
implementation.

Although I first met Doxiadis in October 1931 when we both
entered the Athens Technical University (Ethnikon Metsovio
Polytechneion, Polytechnic School), Faculty of Architecture, I
will trace the evolution of his thinking to earlier phases. Before
that date, as I know from Doxiadis himself and from mutual
friends, he was an active and vivid high school student in the
"Varvakeion," the most demanding Athenian high school for
specialization in science. He managed to be among the six or
seven top students in his class, although he devoted a lot of
time and enthusiasm to extracurricular activities, like excur-
sions, sports, and participation in the boy scout movement.

Passing the entrance examinations of the Athens Technical
University was something of a feat: out of many hundred can-
didates only a handful were accepted. Doxiadis initially failed,
having taken the matter rather lightly. Then the following year
he passed brilliantly. Our class of architecture started with
some 45 students and ended up with some 25 obtaining their
degree. Doxiadis emerged consistently as the first one in his
class. Time for extracurricular activities was more restricted
than at high school, since the university curriculum was clear-
ly more demanding. I recall, among such activities, a daring
excursion in very bad weather to Mount Parnes near Athens,
notorious for the similarity in appearance of many of its peaks
so that mountaineers often got lost on it. Rather than return
feeling defeated by nature, Doxiadis, with a handful of friends,
continued ahead, got lost in the thick snow, and the daring

group was only found two days later by a rescue team.

During our first days at the university I happened to be scold-
ed by a rather irresponsible professor of design for something
I had not done. Doxiadis came to "console" me and was very
warm and humane. That occasion marked the beginning of a
relationship which became closer and closer. He was open-
hearted and truly helpful in many ways to his fellow students,
and his personality radiated both among the student body and
among the faculty and administration of the university.

The breadth of his interests and his eagerness to extend
them into ever new fields was shown by the fact that, although
he obtained very good grades in the "main" courses revolving
around architecture, he got even better ones in the courses
considered as secondary or marginal, especially those with a
more pronounced scientific content. What is more, he read
privately and instructed himself in other fields not covered by
the university curricula.

This tendency towards broadening the range of his knowl-
edge took a more concrete shape as soon as he graduated
from the Athens Technical University in the summer of 1935
as "architect-engineer." Doxiadis then went for two years to
Berlin for studies in town planning. This led to his Ph.D which
was granted "With distinction." His thesis, on geometric prop-
erties in the layout of larger groupings of public buildings in
Ancient Greece (Architectural Space in Ancient Greece, in a
later English translation), was quite original and unexpected.
Neither architects nor archeologists had ever suspected that
precise mathematical relations were consciously used by an-
cient Greeks in the layout of their sanctuaries and other pub-
lic spaces. This thesis raised both warm admiration and fa-
natic reaction among specialists, both in Greece and abroad,
until the second English edition (MIT Press, 1972, edited by
J. Tyrwhitt) still more carefully documented than the original
one, brought a final, conclusive proof of its basic assertions.

Although this work showed Doxiadis' tendency towards
learning from the past, the main result of his studies in Berlin
was to familiarize him with concepts which broadened his in-
terests in large-scale planning and multidisciplinary interrela-
tionships. The first step was town planning (Städtebau), ex-
tending in scale from parts of cities to whole cities, and in-
cluding a multidisciplinary point of view. A second step, just
emerging then, was represented by the terms Raumordnung
and Landesplanung, which seemed to fascinate Doxiadis. For
him, they implied, first, a further extension in space, that is from
the city boundary to the region and even the whole country: a
conquest of space of paramount importance in his view.
Second, they implied a multidisciplinary amplification, bring-
ing in geographic concepts and all sectors of economic activ-
ity and, though to a much lesser extent at that time, social, po-

Fig. 1: C.A. Doxiadis as a university student.

litical and other nonphysical considerations. It is characteristic that Doxiadis used both terms in the original German title of his Ph.D thesis, *Raumordnung im griechischen Städtebau.*

Upon his return from Berlin, Doxiadis' first major job in Greece was that of Director of Town Planning Studies at the "Administration of the Capital" (1938-39), a newly created major unit, conceived and promoted by the mayor of Athens, C. Kotzias. This unit, for the first time, covered the entire built-up area within the Basin of Athens with some 50 municipalities (Athens being one of them) and communes. This concept of the "broader capital area" as a new administrative unit seemed to satisfy Doxiadis' conception of the "first step" (i.e. "town planning"). Still, it only just touched the "second step" (regional planning), and Doxiadis longed for a further broadening that could lead to a fuller conceptualization of this step. Thus in 1939 he persuaded the then powerful A. Dimitrakopoulos of the Ministry of Public Works to create a small, independent office within the unit to cover research at both steps. This was called *Grafion Chorotaxikon kai Poleodomikon Meleton kai Erevnon* which means "Office for National, Regional, and Town Planning Studies and Research." The term *poleodomia* (Greek for town planning, or city planning), though still rather new in Greece, was nevertheless sufficiently well established; but the German terms *Raumordnung* and *Landesplanung* had no official equivalent in Greek. Doxiadis was passionately trying to establish and promote them, so he coined the word *chorotaxia* with the wilfully ambivalent meaning "bringing order (*taxis*) to space (*choros*)," implying space at any scale, and also "bringing order to the country (*chora*)," that is, national planning. This was meant as an exact translation of the German *Raumordnung* with a side glance at *Landesplanung.* Doxiadis fought to propagate *chorotaxia* in Greece while another group tried to promote *choronomia.* Eventually Doxiadis' term was adopted and he put it as the first word of the title of the new office. He also added "Research," another favorite of his, in order to bring in scientific methodology.

Under Doxiadis' leadership, this office actually started operating in the spring of 1940. I was among the first planners he called upon to collaborate with him. A few more were soon added, including many who now occupy key posts in Doxiadis

Associates. The first studies were mostly at the town planning level, although regional considerations were also partly covered.

The war temporarily interrupted the activities of this office (October 1940 to May 1941). Its work was resumed during the grim period of the German and Italian occupation of Athens (May 1941 to October 1944) in spite of occasional interference by the occupying forces. Through collaboration with other departments the office grew considerably, exceeding 200 employees in one period.

Doxiadis and I used to walk back and forth from the office every day for most of the period 1940-44. This 20- to 25-minute walk gave us the opportunity to discuss many issues of common interest and to bring us closer together. During the 11 years, 1940 to 1951, I was the one among Doxiadis' collaborators who was dealing most pronouncedly with the theoretical elaboration of his ideas within the framework of the research we carried out: something similar also took place later on, from 1959 to the middle 1960s and, to some extent, also till his death. Thus these daily discussions helped both of us to develop and promote the ideas of ekistics (though not called by this name at that time) of which he was the initiator and I was his closest assistant.

Since action in these fields was unthinkable during the period of the occupation, the Town Planning Office could concentrate on theoretical studies and basic research in human settlements. These activities spanned a very broad spectrum, including quite original types of research. To give a few examples: Doxiadis had been able to persuade the government to undertake, for the first time in Greece, a complete "housing" census included in the general census (1940) that took place just before the war. Indeed, this was more than a housing census as it included very detailed information on many aspects of human settlements. Doxiadis obtained the census sheets from the Statistical Office and organized a large team (mainly university students but also social workers and others) to extract information from the sheets in the form of large, multidimensional tables; many of the results being also drawn on detailed regional maps of Greece. This activity absorbed the energies of a large fraction of the staff for several years, and gave a highly interesting, original, and very detailed picture of ekistic conditions in Greece.[1]

Another activity was the creation of an Archive of Greek Settlements. Each of the some 11,000 settlements of Greece was given a special file where all sorts of available information was gathered: census results, documentation from scanning historic documents at the National Library by a special team, documentation from ad hoc surveys and studies, information on war destruction, and so on. Many other original studies, often quite specialized (e.g. microclimatic studies of settlements, research on new building materials, global theoretical studies on settlement structure and distribution, including various mathematical models) were carried out, at various degrees of detail and sophistication.

There was also time for more private activities. For a period a few of us, including Doxiadis, made a point of starting our day (7 a.m.) at a public swimming pool, an invigorating habit before the start of the office work (8 a.m.). Still, work at the office was unusually intensive, and many of us worked often until late at night, over weekends and holidays, since one of Doxiadis' main talents was to inspire enthusiasm in his collaborators for whatever they undertook.

The concept of "ekistics" was already clearly inherent in most of these wartime studies, especially in the team work and group discussions within this town-planning office, generally under the leadership of Doxiadis. What emerged was a tendency towards a *global* approach:

• First, in space, from the smallest area unit, the room or the building, through the region, to the largest (the whole of

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Greece, and beyond);

- Second, in a multidisciplinary approach including the physical aspects familiar to planners to concepts from geography (e.g. W. Christaller's central place theory), economics (which Doxiadis viewed as the primary driving force in the creation and development of human settlements) and the social sciences;

- Third, in several other dimensions of human settlements, studying such properties as densities (i.e. fantastically detailed maps of cities like Athens were prepared, with densities by building block established from air photos, and were used as a basis for various density models), time (from prehistory through history to the present and – with special emphasis on novel ad hoc methodologies – projected into the future), and structure of settlements in terms of neighborhoods or communities (based on Abercrombie's studies adapted to Greek conditions);

- Fourth, in abstract models, which were important for the development of ekistic concepts;

- Finally, in a vast and systematic documentation effort, including the Archive of Greek Settlements mentioned above, an ekistic library, which was not only respectable in size but was probably the first scientific library in Greece to be organized according to modern principles of librarianship, and a special archive was constituted to record all war and occupation destructions throughout Greece, not only in settlements, but in all other fields (agriculture, cattle breeding, forestry, transportation, industry, shipping, population – including special groups, like the story of the some 60,000 Greek Jews exterminated by the Nazis – etc.). This "underground" documentation was accomplished through a variety of networks, like Red Cross informants, ad hoc visits, semi-official documents, and many other channels. Its objective was to assemble as clear a picture as possible of the total amount of destruction in Greece for when the country would be liberated, so as to have a firm basis on which to base its subsequent reconstruction.

Immediately after the occupation of Greece, in 1941, a semi-underground "Circle of Technologists" was created led by Doxiadis. Most of his staff from the Ministry of Public Works participated, as well as others. They held weekly gatherings at private homes where the members gave papers on the results of special studies they were undertaking on a variety of subjects, mostly related to ekistics. These papers were published in an underground journal, with the title *Chorotaxia* (in Greek). This appeared approximately weekly throughout the occupation period of Greece and both the title of this publication and its subject matter showed Doxiadis' great interest in the ekistic approach (although this was not yet precisely formulated), as well as his interest in a global and large-scale approach. This was the first of three journals sponsored by Doxiadis: the two later ones being *Battle for Survival*, in Greek and *Ekistics*, in English.

Another wartime activity was straightforward resistance to the occupying powers. Doxiadis became engaged in several underground organizations. Like several other members of his staff at the Ministry, including the writer of these lines, he participated in resistance groups dealing with such activities as information, contacts, spying, direct resistance, and such, often in quite complex and dangerous networks, so that the participants had to hide for various periods. Apart from their political aspect, these activities also helped Doxiadis and his staff to gather more information on the destruction and other matters that would affect Greece's reconstruction and recovery after its anticipated liberation from the "Axis."

When liberation took place (October 1944) the material was ready and available, so that several publications on Greece's

destructions and its recovery problems could appear (including a very large, multilingual publication, with color illustrations, issued by the Ministry of Foreign Affairs). What is more, an overall plan, both for settlement reconstruction and for the more general economic recovery of Greece, had been prepared by Doxiadis and his friends. This was presented in a series of publications (Reconstruction Publications, in Greek) that were issued almost immediately after Greece's liberation.

From 1946 to 1948 some 40 volumes were published of which no. 1 was significantly called *Ekistic Analysis* and was written by Doxiadis himself. Conceptualizing and presenting this overall plan for Greece was a major accomplishment for the team who worked on it under Doxiadis' leadership, given the conditions then prevailing. It can also be justifiably considered to express the "birth of ekistics." Its roots went back to the beginnings of the Office for National, Regional, and Town-Planning Studies and Research (1940) and the Circle of Technologists (1941) mentioned above, when the foundations of the whole theory of ekistics were being laid. The formulation of the plan itself as a consistent whole was based, to a great extent, on entirely new ideas and was the product of the end of the occupation period, that is, 1943 and 1944. The further elaboration of this plan, and its actual implementation, was undertaken in the subsequent periods. In 1945-48 ekistic reconstruction was under Doxiadis' own leadership. It continued, following his principles, until about 1953, by which time the original plan was virtually completed. In 1948-52 the general economic recovery of the country took place under the Marshall Plan. From 1948 to 1951 this was under Doxiadis, who then laid the foundations for Greece's further development. How thoroughly conceived this plan had been, was confirmed by the success of its predictions for the coming 20 years. These had seemed totally out of scale when first enunciated by Doxiadis, but, during the next 20 years, actual events followed his curves for ekistic development with surprising precision.

Although the concept was firmly there, the term "ekistics" had not yet been invented. The terms that Doxiadis was struggling with in the early 1940s were the Greek equivalents of the German *Raumordnung* and *Landesplanung. Chorotaxia* was conceived as covering many human activities, and it was subdivided by Doxiadis according to different types of activity: he would speak of the "*chorotaxia* of production," of the "*chorotaxia* of transportation," and so forth and, among others of "*ekistiki chorotaxia,*" that is, *chorotaxia* as related to human settlements. He used this term first in 1944, as I recall, and it was a very close approximation of the use of the term "ekistics" as it later evolved. During the period 1945 to 1951, Doxiadis was trying to promote the use of *ekistiki chorotaxia* into current Greek parlance. But the civil servants at that time preferred to use the unorthodox Greek term *ekismos.* This originally meant "settlement," but was being forced to mean "activities around settlements," or "planning settlements," or "science of settlements." In a way it came to adopt the meaning of the subsequent term "ekistics." Doxiadis, although he disliked this corruption, did not fight at first against this use of *ekismos.* From the late 1940s he himself used the term *ekistiki* ("ekistics"), but timidly at first, and it was only in the middle 1950s that he came to insist on its consistent use.

The postwar reconstruction and recovery activities can be separated into two main periods, as far as Doxiadis' participation in them is concerned. The first period was the *Reconstruction Period* (1945-48). This was concerned with the reconstruction of settlements throughout Greece and was led by Doxiadis, initially under the Office for National, Regional, and Town-Planning Studies and Research of the Ministry of Public Works; then as Undersecretariat of State for Reconstruction, 1945-46 (the only time in his career that Doxiadis moved out of the civil service proper into a political post); then as *Ypiresia*

Ekismou, i.e. Department for Ekistics (now the term got officially into the title), again within the Ministry of Public Works. In fact it was always the same unit, with more or less the same staff and located on the same premises since 1942. In the second period – the *Recovery Period* (1945-51) – Doxiadis was leading the economic recovery of his country under the Marshall Plan.

In 1946, Doxiadis participated in the San Francisco Conference that was the origin of the UN. In the same year he attended a housing conference in Brussels and, in the 1946-48 period he met repeatedly with the housing subcommittee of the ECOSOC of the UN in Geneva. I was also present and I remember on one occasion, when Doxiadis was unable to attend, R. Fitzmaurice of England told me: "We really miss him, especially his extraordinary capacity to find a solution acceptable to all, whenever our committee reaches an impasse."

A multitude of international contacts kept Doxiadis and his group abreast of the latest developments in fields related to reconstruction, in many countries and in many international organizations. Still, the central ideas remained his own – clear, original, powerful, and perfectly workable – and they evolved unmistakably from what was his first, still unripe, conception of them in 1940-41 to a systematically organized body of knowledge, capable of being applied with success for facing situations as complex and difficult as that of reconstructing the entire war-ravaged country of Greece. Some of these ideas were presented in the Reconstruction Publications (for example *Ekistic Analysis, Ekistic Synthesis,* and others), but this presentation was far from reaching an integration of the entire system. This had to wait until much later (1968), when his book *Ekistics: An Introduction to the Science of Human Settlements* was published.

This reconstruction effort was applied under the terribly difficult conditions of the civil war in Greece, that raged until 1949, especially in the remote areas where the reconstruction needs were more pressing.

The reconstruction of the destroyed settlements of Greece was a formidable task: 1,500 villages, out of a total of 11,000 for the entire country, were totally destroyed and several towns, large and small, had suffered extensive destruction. The total loss of building wealth in Greece amounted to more than 450,000 units, or more than 25 percent of the total (this being the heaviest toll, along with Poland, suffered by any European country during World War II). What had immediately to be provided was about half the total number of destroyed houses, that is, about 200,000.

Providing 200,000 houses throughout the country, as quickly as possible, was an overwhelming task, especially for a country so heavily destroyed, poor, and disorganized as Greece immediately after World War II. It meant an entirely new overall conception of the multifarious problems of Greek settlements, that was not to be found in any textbook on planning, engineering, economics, or any other traditional discipline. And implementing the corresponding program meant facing and solving even more insurmountable problems.

The department that undertook it (whatever its changing name) soon grew to a large size, with a central office in Athens, responsible for the conception, planning, programming, and coordination of implementation, and an impressive network of regional offices covering the entire country to its remotest corners, responsible for the implementation at the local or regional scale and for feedback to the central office. The work was carried out at a frantic pace, partly to cope with the unbelievably pressing situations, but also as a consequence of the enthusiasm inspired by Doxiadis in all levels of his staff.

Programming for a multitude of specialized tasks had to be carried out in detail. To give just a few examples: a first task was the relocation of those destroyed settlements which had

Fig. 2: C.A. Doxiadis in his early thirties. (Photograph: Courtesy of the Constantinos and Emma Doxiadis Foundation).

been located in unfavorable sites high up on mountains in places remote, inaccessible, insecure, and far from their fields (for historic reasons, protection from pirates, etc.). Multidisciplinary committees were organized, comprising, typically, a geologist (for earthquakes, landslides, etc.), a hydrologist (for floods, water supply), an agriculturist, an architect, a civil engineer, an economist, a social worker, and often a few more specialists. These committees surveyed about 1,000 settlements that seemed to require relocation. Eventually, after long consultations with the inhabitants, they recommended the displacement of about 300 of them. After adoption by the central office, new discussions took place, and eventually over 100 settlements were rebuilt on new locations. In spite of all precautions, a few failures could not be avoided: some inhabitants who had declared to be in favor of the displacement eventually changed their minds, so that when the new village was rebuilt, in a few cases only half of the inhabitants moved there, the rest remaining in the old, destroyed village. Nevertheless, the operation was a brilliant success as a whole: indeed, few other countries have been able to do anything comparable.

The reconstruction was mainly concerned with the rural areas of the country, where war destruction was by far the heaviest. In this rural reconstruction one should first keep in mind the disproportionately large dimensions of the problem, then the destruction, dismemberment and disorganization of postwar Greece (one of the poorest European countries at that time, except Albania), and third the complexity of the task. Viewed in this light, the program of rural reconstruction can be said to have been highly successful: (a) it was able to provide in their totality the necessary number of houses (about 200,000) for the bulk of the rural inhabitants whose houses were destroyed; they were thus kept in their villages or helped to return to them if in the meantime they had fled to the cities as refugees; (b) the houses provided were wholly permanent; no temporary houses, and consequently no slums, were left over

at the close of the reconstruction period (about 1953); (c) the houses provided corresponded well with the actual needs of the peasants housed: although the first ones provided immediately after World War II were inevitably smaller than what was needed, soon after they increased in size and became much better adapted to what the peasants wanted, so that, by and large, the bulk of the houses provided could be said to serve their purpose well enough; (d) the cost to the state per house was kept to a minimum, thus allowing the extremely limited funds available in the budget to suffice for building the total number of necessary units; this necessitated an ingenious approach to financing, acquisition of building materials, research and other organizational measures: (e) the owner's contribution was maximized, especially in the "self-help" phase (also, to a lesser extent in the initial "nucleus" phase); (f) through adequate self-help techniques and public participation measures, the owner was induced to love his house, and consequently to improve, embellish, keep up, enlarge, and otherwise better his house and make it more livable and better adapted to his needs; (g) the regional approach (for example, relocation and redistribution of settlements, increased regional productivity of building materials, social organization within the region) from the local to the national scale, helped to place the whole program in the proper perspective; (h) the research carried out and the theoretical approach developed helped to conceptualize the program correctly, and unifying it; as important by-products of this theoretical effort we might single out, first, the creation and development, in its first stages, of the new discipline of ekistics, and second, the training of a large number of specialists in these new techniques, so that they could become an important asset in helping their country in other subsequent programs.

Although this program may appear merely as "housing," or as "rebuilding of villages," its scope was actually much broader. In fact, it meant a reorganizing of the entire country from the point of view of settlements, and Doxiadis was right in regarding this venture as the first large-scale ekistic program, in fact the one within which ekistics itself was born.

In 1948, when the Marshall Plan started being implemented in Greece (1948-52), Doxiadis took over, organizing a new group within the Ministry of Coordination, in the form of a department called *Ypiresia Syntonismou Epharmogis Schediou Anasyngrotiseos* (YSESA), i.e. Department for the Coordination of the Implementation of the Recovery Plan. This department, under Doxiadis himself had the task of supervising and coordinating the capital investment programs of all Greek ministries and public agencies, thus orienting Greece's recovery program in a systematic and consistent way. A great deal was achieved in the areas of agriculture, transportation, commerce, settlements (ekistics), public health, reorganization of the public services, education, fisheries, mining, power and other activities. One of the major outcomes was the establishment of a unified power network throughout the country, involving both thermoelectric and hydroelectric power generation.

Inside the changing Greek governments Doxiadis continued vehemently to push forward his ideas, first as the Coordinator of Greece's Recovery Program and later as permanent (i.e. nonpolitical) Undersecretary of State for Coordination. He also convinced the US Marshall Plan to adopt the solutions best suited to Greek realities, again obtaining brilliant results. In so doing he achieved recognition from the top leaders of this program, P. Porter, K. Iverson, R. Drake, P. Hoffman, W. Cisler, and others. Doxiadis was particularly successful in bridging the gaps between the views of these representatives of the US Mission and the members of the Greek government and Greek high officials, and in promoting those ideas that were in line with the plan he had evolved himself, with the assistance of his main staff. He recruited high caliber persons, partly from

the government, and, to a greater extent, from private business. These, out of sheer enthusiasm, devoted themselves to the highly demanding and quite novel tasks he was entrusting them with. The whole department was organized according to a matrix system, having "horizontal" branches according to the types of economic or other activity and intersecting "vertical" ones according to levels of coordination.

Although human settlements – ekistics – were just one out of some 25 sectors of activity under this recovery scheme, Doxiadis did not forget his baby: he kept his special interest for it and contributed to it a markedly larger share of his entire energy, in terms of personal effort, thinking, theorizing, even affection. In spite of Doxiadis' later frantic preoccupation with the Recovery Program, he was still able to instill ideas into the continuing Reconstruction Program. He constantly managed to fertilize it with basic thinking and to help it grow as efficiently as possible. Indeed the attacks of economists on his priorities for settlements made Doxiadis think harder and develop new weapons for securing even higher priorities for them. In so doing, he was able to develop the concept of ekistics more methodically and more efficiently.

Some side activities of the Recovery Program included a new publication series, following immediately upon the Reconstruction Publications of 1946-48. The Recovery Publications (1948-50) comprised some 85 volumes, in three series, on various theoretical or applied aspects of the Recovery Program. They were published in Greek, but a handful of volumes also appeared in an English version. In addition, Doxiadis started a weekly periodical, *Struggle for Survival,* in Greek, that gave all interested people a cross-section of the progress of the recovery effort.

In 1951, when the Marshall Plan was in full swing and nearing its completion (three years had elapsed out of the four of the entire plan), Doxiadis fell ill with a stomach ulcer, due to excessive stress and overwork. He was taken to hospital and operated on. At the moment when he was most helpless, the Minister of Coordination quite unjustly feared that Doxiadis might have political aspirations, and that his own power might diminish. He therefore decided to get rid of him. Since a permanent civil servant cannot be fired under Greek legislation, the only way was to abolish his post. This was done by secretly arranging with 30 members of parliament (out of 300) to stay late at one of the parliamentary sessions, so that, when all the other members had left (it was 3 a.m.) these 30 could pass a law abolishing the post held by Doxiadis.

Doxiadis was deeply hurt at this treatment – as were his Greek and his American friends. As soon as he was in sufficiently good health, he left for Australia, to start another stage of his career there by forming "Doxiadis Associates."

At the Ministry of Coordination about 30 of his friends resigned, out of indignation. Greece's Recovery Program came into different hands, but its foundations had already been so firmly laid by Doxiadis that its future course was secured in its essentials.

Ekistics had been born. The slow process that started in the early 1940s evolved more rapidly in the late 1940s. Its name had not fully crystallized then, but it was coming close to final adoption, which took place in the mid-1950s. But by then its concepts already existed as a respectable body of knowledge. Organized into a coherent system, it represented an emerging new discipline, that seems to be called upon to play an increasingly important role in the future of our world: ekistics.

Notes

1. Unfortunately most of this material, as well as many other excellent studies, were lost in a fire that ravaged the premises of this office toward the end of the occupation period.

The first issue of the journal, October 1955

The birth of the journal dates back to 1954 when C.A. Doxiadis and Jaqueline Tyrwhitt met in Delhi in connection with the first U.N. International Symposium on Housing and Community Planning – Tyrwhitt was its Director and Doxiadis a distinguished participant. They agreed there was need for a journal directly aimed at keeping architects and planners in developing countries up to date with relevant professional expertise elsewhere in the world. The following year they met again in London. Tyrwhitt had joined the faculty of Harvard University's Graduate School of Design and Doxiadis had contracted to prepare a five-year

National Housing Plan for the Government of Iraq. He said he was prepared to finance a monthly bulletin of information useful to his staff stationed in forty different locations in the Middle East. Tyrwhitt agreed to produce it provided it would also be sent to U.N. housing and planning experts working in developing countries, as she pointed out in a discussion with the current editor of the journal in early 1980. Thus Ekistics was born, though for its first two years it was called Tropical Housing and Planning Monthly Bulletin. Its first number appeared in October 1955, with reprints of articles from other journals and gradually evolved into having mostly original papers.
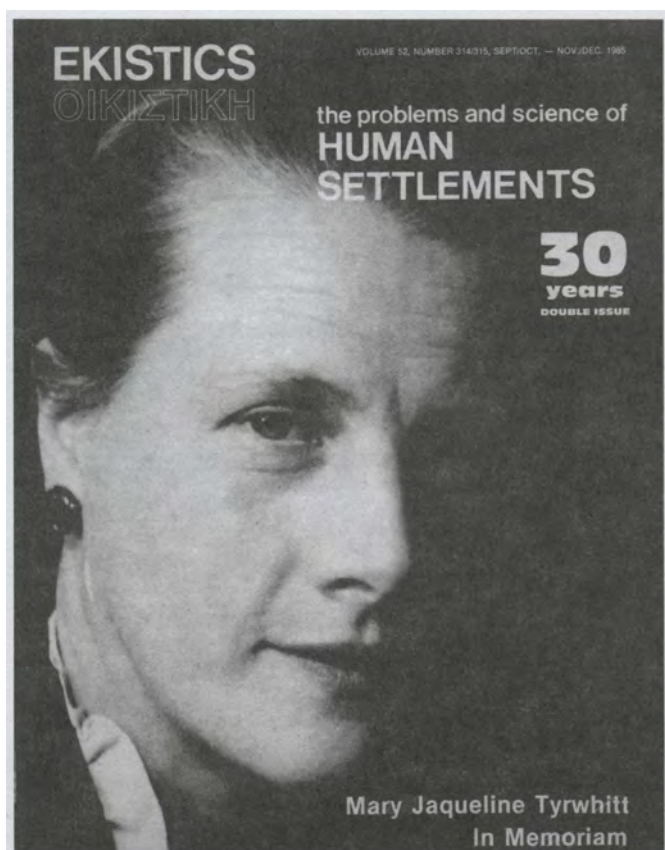
Cover of the special double issue of Ekistics (vol. 52, no. 314/315, Sept./Oct.-Nov./Dec. 1985) dedicated to the memory of Jaqueline Tyrwhitt on the occasion of 30 years' circulation of the journal, with a photograph of her in her late thirties. (Photograph: Courtesy of her niece Catharine Huws Nagashima).

Mary Jaqueline Tyrwhitt, 1905-1983

Professor Mary Jaqueline Tyrwhitt (1905-1983) was the first Editor of the journal from its initial issue in October 1955 to June 1969. She became co-editor with Gwen Bell from July 1969 to December 1972, and on the occasion of her "retirement" to the post of Consultant Editor in January 1973 she was said by C.A. Doxiadis to have been "an exacting collaborator and the most suitable I could have selected to be the first editor of Ekistics." After the death of Doxiadis in June 1975 and the subsequent resignation of Gwen Bell as Editor in December 1977, Jacky felt the need to be more actively involved herself with P. Psomopoulos as Acting Editor. He took over the editorship upon her death in February 1983. The last issue that she worked on was published as May/June 1983. The Sept./Oct.-Nov./Dec. 1985 double issue was published in her memory, with a selection from her own writings, and contributions from her friends and colleagues on her life and work.

The first fifty years of the journal, 1955-2005

On the following four pages we present a list of all issues of *Ekistics* to date:

- the journal was first issued in October 1955 as *Tropical Housing & Planning Monthly Bulletin;*
- in 1956 it became *Tropical Housing & Planning Monthly Information Bulletin;*
- in October 1957 it became *Ekistics: Housing & Planning Abstracts;*
- in May 1959, it came out as *Ekistics: Abstracts of the Problems and Science of Human Settlements;*
- in January 1961, the journal appeared as *Ekistics: Reviews on the Problems and Science of Human Settlements; and finally,*
- in January 1965 and for the last forty years, it has been published as *Ekistics: The Problems and Science of Human Settlements.*

The material concerning Human Settlements – "ekistics," which includes town and country planning, settlement geography, urban economics and sociology, architecture, and other disciplines with a bearing on human settlements – was taken primarily from sources not easily accessible to most planners, i.e. project reports, or articles in periodicals not commonly read by them. After obtaining clearance from author and publisher, the articles were reproduced either in full, or in abridged form.

For many years, articles in *Ekistics* were exclusively such "borrowed" ones. But as the popularity of the journal increased, the house bulletin became a full-scale monthly periodical sold on subscription; it started being printed (at Doxiadis' own printing outfit in Athens), originally with a harder black and white cover, and later with a cover in color. As the journal's fame grew, original articles solicited and unsolicited were added to the reprints. Soon, these original pieces, many specially written for *Ekistics* by experts of international standing, displaced the older "borrowed" material. Issues devoted to special subjects also increased in frequency, and for many years now every issue is devoted to a special subject.

Today, the journal circulates in 140 countries, in most cases on subscription, but it is also frequently exchanged with periodicals published by other organizations. For almost all its life, *Ekistics* has had to be subsidized – by C.A. Doxiadis himself, by Doxiadis Associates and by the Athens Center of Ekistics, which has been its owner and publisher since the early 1960s, and occasionally with the help of grants from third parties such as the Ford Foundation, or raised through the efforts of distinguished members of the World Society for Ekistics. In a few cases, guest-editors undertook special issues, always in close collaboration with the editors.

The journal is now regarded, internationally, as one of the main sources of information not so much on the work of the Athens Center of Ekistics (especially its research effort and the outcome of its conferences) but on all aspects of human settlements from a wide spectrum of sources the world over.

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*2	November	Tropical Housing & Planning
*3	December	Tropical Housing & Planning

1956
*4	January	Tropical Housing & Planning
*5	February	Tropical Housing & Planning
*6	March	Tropical Housing & Planning
*7	April	Tropical Housing & Planning
*8	May	Tropical Housing & Planning
*9	June	Tropical Housing & Planning
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*11	August	Tropical Housing & Planning
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* out of print

Notes
1. Issues are obtainable from EKISTICS, Athens Center of Ekistics, 23 Strat. Syndesmou Street, 106 73 Athens, Greece (Telephone: +30 (210) 3623216 and +30 (210) 3623373; Fax: +30 (210) 3629337).
2. Issues as far back as 1959 can be purchased in microfilm by writing directly to:
   ProQuest
   300 North Zeeb Rd
   P.O. Box 1346
   Ann Arbor, MI 48106-1346
   U.S.A.

C.A. Doxiadis at the 1958 New Year's Party of Doxiadis Associates.

At the C.A. Doxiadis' lectures at the State University of New York, USA, 28-29 April, 1970. (*Source:* © Constantinos A. Doxiadis Archives of the Constantinos and Emma Doxiadis Foundation).

C.A. Doxiadis at the Consolidated Management Meeting in Pittsburgh, USA, May 1971. (*Source:* © Constantinos A. Doxiadis Archives of the Constantinos and Emma Doxiadis Foundation).

The C.A. Doxiadis Reader

Table of contents

1. Introduction

The jacket of Miloš Perović's book entitled *C.A. Doxiadis: Anthropos and Polis* (Belgrade, Nolit Publications, 1982), in Serbian.

A reader on ekistics, thirty years after Constantinos A. Doxiadis

The guest-editor's foreword

Miloš R. Perović

Dr Perović, guest-editor for the present volume, is Professor of History of Modern Architecture at the Faculty of Architecture, University of Belgrade. He is a member of the World Society for Ekistics. More about the author can be found on pages 6-9.

● Coming from a multi-ethnical family, I felt that in my youth I had more opportunities than most of my colleagues and friends. My mother was of Greek descent and my father was a Serb.

As a student of the Faculty of Architecture in Belgrade, I used to spend my summer holidays in an apartment in Karneadou Street next to Kolonaki Square in Athens, Greece. In the evenings, I used to sit in the then fashionable Ellinikon Café/Restaurant in the northeastern corner of Kolonaki Square. That is where I learnt, for the first time, about Constantinos A. Doxiadis and his ekistic theory. A few years later in the Kaufmann Bookshop, Stadiou Street, I bought Doxiadis' book *Architecture in Transition.* Simple phrasing and the power of arguments made me instantly one of his admirers.

● When I applied to join the Graduate School of Ekistics of the Athens Center of Ekistics, Doxiadis' reputation as a thinker and practicing planner was at a peak in Belgrade due to the work he had done in Skopje and to the fact that he had been decorated by the Yugoslav government. Now that I am approaching the end of the seventh decade of my life, I can say that the almost three years that I spent at the Athens Center of Ekistics of the Athens Technological Organization were the best and most creative part of my life.

● When my student days were over and I returned to the City Planning Institute of Belgrade, thanks to Doxiadis' prestigious reputation, I was immediately assigned important tasks, i.e. staging plan for the development of Belgrade, for the period 1976 to 1985; research into alternative urban models; study for the reconstruction of the central part of new Belgrade; and staging plan for the development of Belgrade for the period 1981 to 1990; etc.

In all these projects I used Doxiadis' ekistic theory and methodology.

● In order to facilitate communication between me, as a project manager, and my collaborators, I proposed the publication of a Doxiadis Reader to one of Belgrade's publishing houses, suggesting that the book also be used in other parts of the country.

Once printed, the book under the title *Anthropos and Polis* became an immediate success. The first edition of 4,000 copies – which is an enormous figure for a small country such as Yugoslavia – was quickly sold out, and thereafter the book went through many reprints.

When I was invited to leave the City Planning Institute of Belgrade and to join the Faculty of Architecture, University of Belgrade, as a full professor, I learnt that for more than a decade this publication had been a major textbook at the faculty's Department of Town Planning. Most probably, it was also a major one in other centers of higher education in Yugoslavia.

Bearing all this in mind, it is now much easier to understand the structure of the book. It reflects the relevance of its contents to the major town planning problems and issues at that time in Belgrade and the rest of the country, and to the search for remedies through the media of *Ekistics* in texts where practical proposals and concrete solutions prevail over the more abstract notions of Doxiadis' many-sided personality.

● Needless to say, how happy I was to accept the invitation of the Editor of *Ekistics* to act as guest-editor for a special volume of the journal on "A reader on ekistics, thirty years after C.A. Doxiadis" based on this work.

● There are two major changes from the 1982 Serb edition of the book. I thought that the editor's introduction to the Serb edition more than a quarter of a century ago should be omitted for this commemorative publication. Constantinos A. Doxiadis established *Ekistics* 50 years ago, he was a frequent contributor, and he is well known to its readers. The second major change is the increased number of illustrations than those in the Serb edition to reflect more accurately the author's original intentions.

● Now, as we are commemorating the thirtieth year of Doxiadis' death, an initiative that comes from Belgrade for a new edition of *Anthropos and Polis* and also the present volume of *Ekistics* derive from the immortality of his legacy.

C.A. Doxiadis lecturing at the Georgia Institute of Technology, Atlanta, Georgia, USA, 27-28 February, 1968. (*Source:* © Constantinos A. Doxiadis Archives of the Constantinos and Emma Doxiadis Foundation).

The science of ekistics

Our knowledge of human settlements

This is not the first time that Man has dealt with human settlements. It may, therefore, be useful to examine how he faced his problems in the past. Actually, he has been handling these problems for thousands of years—very roughly speaking for about ten thousand years in villages, and five to six thousand years in towns; and, for as far back as we know, he has always set the same goals for his life in a city. We have Aristotle's word for that. If this is so, then how has Man dealt with the problems of the study and creation of human settlements, and why are we now seeking new methods and solutions for old problems?

For several thousands of years, Man lived in villages. The demand for community services was very small, and we have no reason to believe that the villages failed to provide the services they were expected to provide for Man. Then, about five to six thousand years ago, Man started to build cities. Conditions in these cities must have been quite satisfactory for quite a long period. This may seem a strange assumption when we consider the technological progress achieved very recently in cities—the progress of sanitary facilities for example, or even the large capital investments in cities made in recent years. However, if we consider that more and more people are being killed or maimed in traffic accidents; if we re-

member how difficult it is today to move from one part of the city to another without wasting time and effort and without getting tired and exasperated; if we remember that racial and social problems are increasing and reaching critical proportions, that the delinquency rate is very high; and if, finally, we recognise that our settlements usually do not create a proper environment for a better life, we may conclude that conditions were more satisfactory in the past. This is especially true when we take into consideration the lower expectations of Man in earlier times.

In the past, settlements were certainly poor and technologically much less developed than today, but so was the whole of mankind. Expectations were, therefore, lower than at present. From the point of view of health, conditions in the larger cities were in several respects less hygienic in the past, especially in the poorer sections; but contemporary cities do cause diseases for body and mind. In many villages, on the other hand, conditions were not greatly different from what they are today. Life in the cities and towns, so far as we can judge, was better organised, more unified and more homogeneous. Certainly a reason for this was that the cities were much smaller than they are today. Until the eighteenth century, most cities of the various civilisations of the world did not exceed fifty thousand inhabitants. It was only on rare occasions that they reached higher figures, and, on the whole, only for very short periods. Beginning in the eighteenth century, however, cities started to attract several hundred thousands of inhabitants, so that around 1800 Man witnessed the emergence of London as the first million-inhabitant city of the contemporary era.

Thus, with small populations and no mechanical means of transportation, most cities of the past, even the larger ones, did not exceed about two kilometres in length (fig. 1) and could

grid 1 x 1 km   Athens 5th century   Priene 4th century   Miletus 4th century   Olynthos 5th century
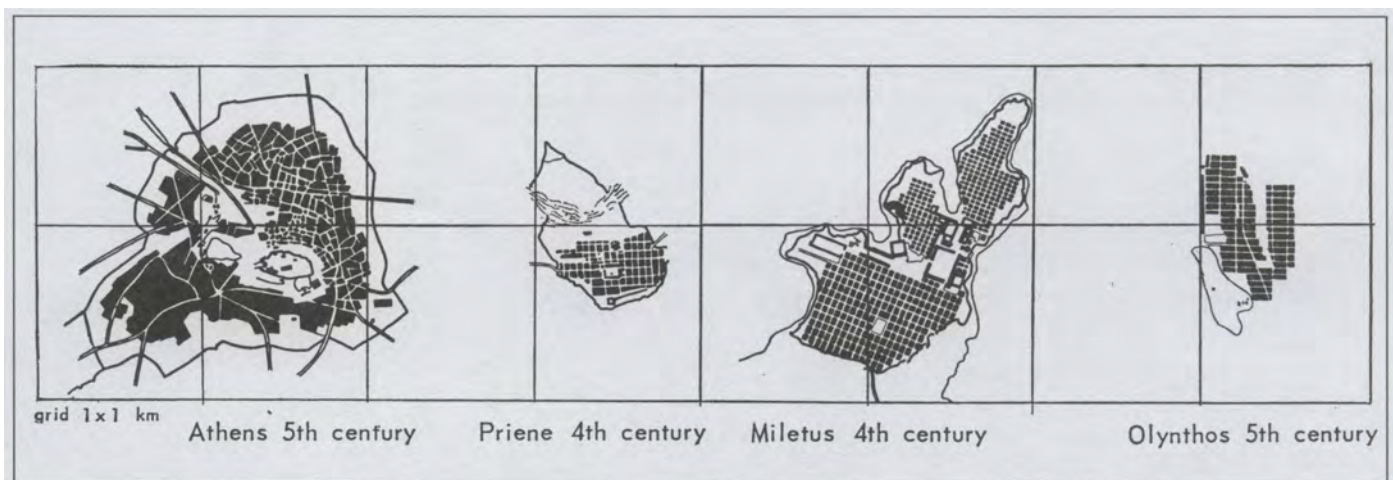
Fig. 1: Ancient Greek cities.

be crossed on foot in not more than about twenty minutes. These cities had yet another characteristic: most of them were surrounded by walls for long periods of their existence so that, either their population could not increase, or the increase was so small that it could be absorbed inside the existing walls. Only seldom, and with intervals of whole centuries between, did it become necessary to expand the area of the towns and build new walls. In the Byzantine city of Constantinople, one of the largest cities before the eighteenth century (fig. 2), created by Constantine the Great in the fourth century, enlargement was necessary only once; it was carried out by Theodosios II in the first half of the fifth century.

old walls of the small city

walls of Septimus Severus built before the creation of the Byzantine Empire (A.D. 196)

walls of Constantine the Great built in A.D. 325 when Constantinople became the capital of the Byzantine Empire

walls of Theodosius built during the first half of the fifth century
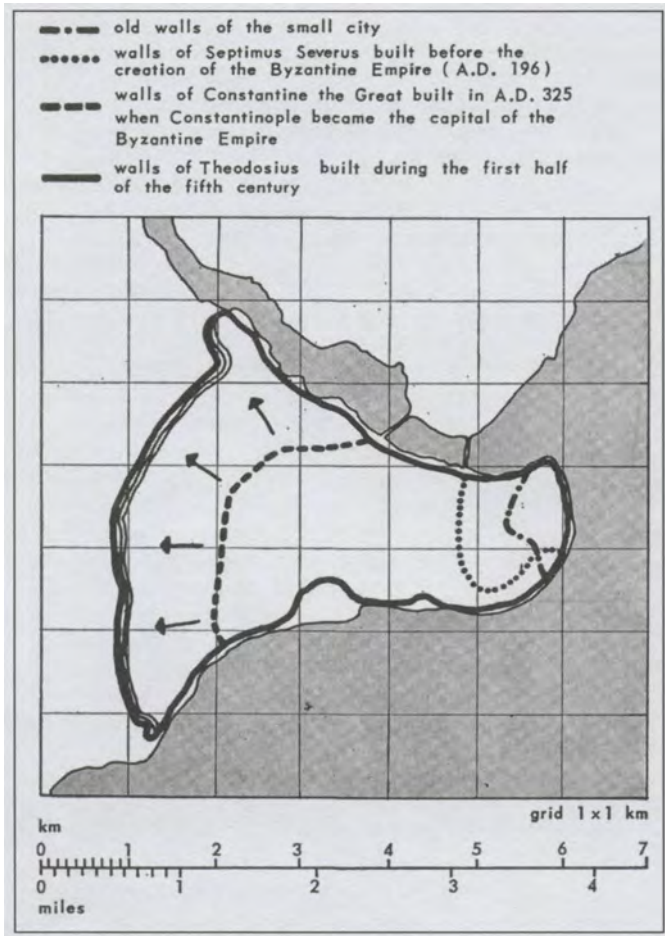
Fig. 2: The expansion of Byzantine Constantinople.

Because their physical dimensions were small and their development slow, these towns were built on a human scale. Man walked freely inside them from one end to the other without meeting obstacles. He walked about the town feeling at home in it, enjoying it, hating it, admiring it, criticising it, living in it, so that it gradually became for him a kind of work of art in which he was deeply involved. This was the beginning of a long love affair between Man and art, as expressed by the town in which he lived. To realise this better, let us remember that the Acropolis of Athens was built over a long period of years and during several different phases of Athenian history. And we also remember that many important towns did not change in size over long periods of their history. Michelangelo, for instance, grew up and lived the greatest part of his life in Florence, a town that was essentially static. He walked its streets and its squares, and had time to think and let ideas ferment in his mind as to where statues or monuments were

needed. The statues and monuments which he created were therefore linked with the town and with its inhabitants. When he placed his David at the Piazza de la Signoria, people came at night and stuck notes of praise or disapproval on the statue. Town, square and Man were all interconnected to form a unified entity.

In these towns which were, as we like to say, technologically undeveloped in relation to modern ones, but small and on a human scale, a man could walk about, comprehend, assimilate, become integrated. If a new idea in architecture was implemented, it could be established only if public opinion accepted it, because a new house was one of the very few being built in one year. Naturally, it would become the centre of attention and criticism, and, if it seemed to be good and to contribute to progress, other people copied it. If it was ugly, society did not accept it, and the house was ignored; no one copied it and little by little it was forgotten. Thus, through small experiments, small mistakes were corrected and improved. Through trial and error, architecture and the city developed.

In a way, each man was an expert on the subject of his town. If a town had only two-storey houses, nobody would lightly and without good reason have dared to build a three-storey house. Everyone knew that the masons were not accustomed to it, that the people would revolt against such a construction, since everybody was used to the idea that all people lived in similar types of houses, and that only public buildings or buildings dedicated to God could distinguish themselves from the others by location, height and investment. There was no necessity even for the common man to possess any special knowledge in order to know exactly what type of house was acceptable in every street and neighbourhood, and to know that public buildings should give a special character to every settlement and every section of it.

We can see then that most of the towns of the past were created by their inhabitants in a collective, slow, systematic and not always conscious collaboration, which ensured survival of the best elements already in existence. This was a collective knowledge, which for many people could have been conscious, but for many others was certainly unconscious. As for the few towns, which were created as such from the beginning, or the parts of towns which did not grow by themselves but were given shape by leaders and craftsmen, these as well had to be in harmony with the traditions created by the people, traditions which demanded that a man of talent express them in more elaborate, official and monumental forms.

When Hippodamos organised the Greek town and planned Miletus, when the Roman planners spread their new towns over their empire, when the Renaissance artists redeveloped the Italian cities, when the Khan-I-Meamaran, or the master-builders of the Great Moguls, created Fatehpur-Sikri and Agra, or the Chinese emperors, Peking, they were all expressing, in an organised, official and monumental way, the trends and traditions which had been created throughout the centuries by the inhabitants of all the villages and small towns they had known in their parts of the world. The ability to grasp such tendencies and the talent to express them in more official forms were necessary in order to lead from the modest achievements of everyday architecture to an artistic and extraordinary creation. That is how the important built-up areas in many towns were created in the past. For us today these are model cities, with qualities that induce us to stay in them as long as possible. This is true not only for the famous ancient and medieval cities, but also for less known settlements of the past that through the years grew gradually and naturally into works of art.

I must repeat: for about ten thousand years Man has lived

in villages, and for more than five thousand years in small urban settlements whose size and slow growth permitted the creation of continuous and compact settlements, and endowed these with values which remain important even today. Man created in these static settlements suitable shells and environment for an organised human life. In almost all these settlements, the five elements (Nature, Man, Society, Shells and Networks) were in complete balance. And even when they did slip out of balance, the divergency was small, and could be brought back into balance without a major effort.

Then, beginning in the eighteenth century, continuing through the nineteenth, and especially in the twentieth century, the picture changed completely. The elements of human settlements are now developing individually at such different paces that the balance between them is lost. Man is developing demographically, culturally and intellectually. Society is growing and becoming more complex. The Networks of the settlements are being multiplied and complicated. Nature is being spoilt; the air and the water are being polluted; precious resources are being destroyed. The Shells which have to cover all these elements and connect them into a rational whole, can no longer catch up with these developments. The changes are too numerous, and they take place too fast.

The magnitude of the change can be clearly seen, for example, in the form of the city and the factors influencing it, the landscape, functions and also the inhabitants. The inhabitants, for many thousands of years, had been limited to human beings and some domestic animals. Then, in the nineteenth century, the advent of the railway had a great effect on the city, although it was able to exert a major influence only on its form, making it spread along the lines of its tracks. But, in the twentieth century, the city is inhabited by both humans and machines, mostly cars. Let us see how the latter influence the form of the city. Man moves at a speed of about five kilometres an hour (three miles per hour), just as he did in ages past, but cars, even in urban areas, move at speeds of up to two hundred kilometres per hour (125 miles per hour). These speeds, however, are not constant, since on many occasions cars cannot, and should not, move at speeds higher than the speed of Man. So, in addition to the original inhabitant, whose speed is constant and uniform, we now have a second one, whose speed fluctuates from five to two hundred kilometres an hour. This fluctuation depends on two factors: an exogenic one, imposed by the form and paving of the streets and traffic regulations; the other endogenic resulting from Man's personal desire to use different speeds. While in the past the structure and form of the city was largely influenced by the movement of Man, now it is influenced by the movement of Man and machine (fig. 3). Furthermore, we now have to reckon with the constantly changing maximum speed of the machine which depends on external causes, such as the design and condition of the roads on which it is moving, or internal ones, such as mechanical improvements which increase its power and speed.

We can also foresee that this potential speed is going to increase continuously, especially when new road designs are accepted and new cars, perhaps radar driven, are in use. We now have to reckon with the form of the city controlled both by Man's slow constant speed and the changing speed of the car and other machines, a speed whose maximum is still unknown. In the past one constant speed factor influenced the shape of the city, but now we have many factors moving at many different speeds and the variety of combination of movements in speed, direction, facilities, and so forth, has become very great. Therefore, we cannot move toward the study of the structure and form of the city without first thoroughly reconsidering the whole system of phenomena and ideas which influence our way of life and the settlements we

build for our life.

This increase in the dimensions and the problems of our cities, as well as the increase of the order of complexity within them, comes at a time when human and social sciences are not sufficiently developed. Fred L. Whipple stated lately that they are in the phase in which the natural sciences were when the telescope was developed.[1] At the same time scientists, natural and social, are tending towards overspecialisation, and consequently losing sight of the whole phenomenon they are dealing with. This is true not only of scientists, but also of the attempts of Man to face the contemporary problems of his settlements. In the first complex settlements of the nineteenth century, and even more in the twentieth-century settlements, Man lost the ability to comprehend the totality of a human settlement, to understand and analyse it, and to create a synthesis out of its many elements. The natural ability which Man acquired in the past, of understanding the evolution of his settlement, of adjusting himself to it and developing it in a way that preserved its existing balance or else creating a new one, has now been lost.

Responsibilities have now been split in many ways. We have a multitude of specialists each trying to solve the existing problem separately. The town-planner is very often no more than a designer of two-dimensional plans with a few
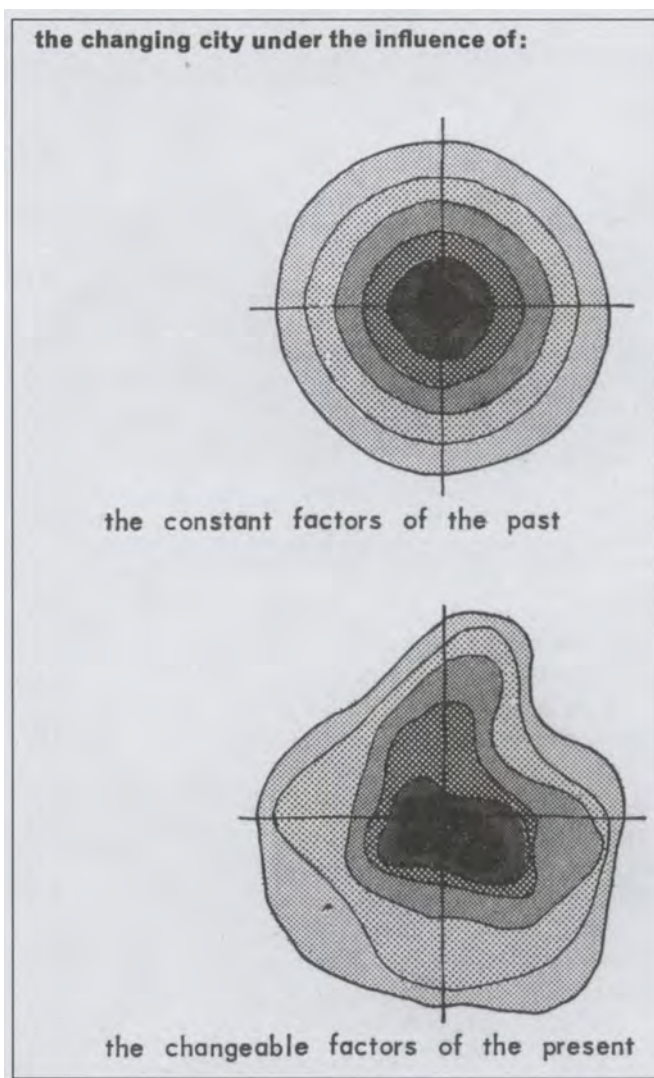

Fig. 3: The changing city under the influence of the constant factors of the past and the changeable factors of the present.

three-dimensional conceptions; the architect can do no more than take a plot of land and build on it and cannot assume the responsibility of the urban space finally produced—he can always throw the blame on the town-planner, or building regulations or attitudes of the neighbours; the civil engineer has been confined to taking care of underground parts of the town rather than what appears on the surface, with the exception of the structural cores of major buildings; the urban economist is simply interpreting urban economic phenomena; the sociologist is only analysing social problems, etc. The traffic engineer confines himself to existing trends, though very often he has to act as a surgeon, cutting open but not healing the city. The artist hides himself in the buildings, as there is seldom place for his work outdoors any longer. But who is it who deals with the whole ? Who is seeing to the balance between Man, Society, Networks, Nature and Shells ?

The gap between Man and his ability to cope with the problems of human settlements is already very big and is constantly increasing. In our course towards extreme specialisation in dealing with the problems of settlements, we have missed the main purpose for which settlements were created: human happiness, the happiness Man finds in the balance between himself and the other elements of his settlement. With every passing day, we are losing more of our ability to face the problem of human settlements in a synthetic way, because the more specialised we become, the more we move away from an understanding of the overall problem, and the more we forget the need for synthesis.

One may ask how we can say that it is only today that we have really lost the ability to face these problems holistically when humanity started to lose this ability in the eighteenth century and more definitely at the beginning of the nineteenth century. It would appear that most of the people now living were born without it. However, I believe, I can insist that the loss of this ability is a continuous process and that we are still losing it, on the following grounds. First, under the influence of many new forces, we are undoubtedly losing this ability in the big cities, although we have, to some degree, maintained it in our villages and small towns, some of which remain under constant, slow development. Even a specialist who fails in a big city may sometimes give a natural and logical solution for the problems of small centres. Therefore, in a way, we still possess these abilities, because we have some small towns and villages that are not under the influence of big, uncontrollable forces, and they can help us to understand correct solutions. Even the most uneducated people, if they give these matters enough thought, will not lightheartedly spoil a small town where everything is still in balance, and even if they do try, it is certain that they will meet with resistance from the inhabitants, unless the latter have already been deformed in their judgment by the nearness of a big city.

Second, I would attempt to answer this assertion in the manner of the aborigines of Australia who, when asked why they put their children in the water of rivers or lakes to swim soon after they are born, replied that they must do so before their children forget how to swim, implying that we have certain natural abilities which we run the danger of losing when life guides us in certain other directions. The ability of our forefathers to produce a synthesis on a certain scale must still exist in us because good examples of their activity still survive, but we are losing it because we are ignoring the various dimensions of the present problem and the need to develop this ability to meet the new requirements of our times.

Faced with the present problems and the present failures, the experts have retreated to their own corners to meet the problems either through separate sciences, such as economics, sociology, administrative sciences, technical and cultural disciplines, or by looking into a special aspect of the problem

like transportation, housing or community facilities. As a result, modern architecture, which could contribute enormously to the creation of better cities, has not done so. Physical planning has been limited largely to regulative rather than creative action, regional planning is lost in theoretical research, and the overall problem has been practically abandoned.

It was only in the twentieth century that the first attempts at a better understanding or solution of this problem were made. Patrick Geddes tried to understand the total situation by extending his research to include several fields of knowledge and several areas of the world.[2] It was not, however, until the years between the two World Wars that specific attempts were made at a better understanding. Some of these attempts were directed towards achieving a knowledge of what was happening, ranging from the micro-scale of Brinckmann's *Platz und Monument*[3] and Camillo Sitte's analysis of old cities,[4] to the enlightening macro-scale efforts of Walter Christaller[5] to understand the interrelationship of settlements in space and the existence of certain networks.

While one group of people dedicated its efforts to an analysis of existing conditions, an analysis leading to a better understanding of the problem of human settlements, and thus limited itself to discovering the causes of our problems, another group, mostly architects, turned its attention to the creation of new forms of cities. In continuation of the efforts already made towards an escape from the existing suffocating cities (the most characteristic example being the garden city movement), there were architects who tried to solve the problems by submitting their own solutions. These efforts are characteristic of the desire of a large number of people to provide immediate solutions to complex problems. But the architects failed to analyse the problems in depth and to understand their cause, partly because they did not have enough facts, and, consequently, they failed in their efforts to find a real solution. They did not act in a scientific way. They did not recognise the changing nature of their subject. On the contrary, most tried to develop a new form of the city by basing their ideas on varying interpretations of the image of the habitat they had from the past. As could be expected, only very few managed to get a glimpse of the forms of the settlements to come, since they had insufficient knowledge to lead them to basically different solutions.

Among these attempts, which were necessarily confined to a relatively narrow field as a result of the limitations imposed by the professional backgrounds and training of their authors, we must mention the work of Le Corbusier. His efforts around 1930 to conceive the 'radiant city' are characteristic of great courage, which is even more impressive if we consider how very little knowledge existed at that time about the problem of human settlements and the limitations imposed on the solutions, especially in the fields of economics and the other social sciences. At about the same time thinkers in other fields turned their attention to the city, and here I should mention Lewis Mumford's very important effort to throw light on the problems and the crisis through his deep knowledge of many of the forces that shape human settlements.

In the post-war period, especially since the fifties, attempts to solve the problems of human settlements by the creation of new cities and the amelioration of existing ones were made. Characteristic of these the 'New Towns' especially prevalent in England, Sweden and the U.S.S.R., the building of new capital cities such as Chandigarh, Brasilia, Islamabad, and others; also efforts at urban reconstruction in Europe and urban renewal in the U.S.A. Although these efforts constitute important experiments in city building, they have not and cannot enrich our knowledge and our experience to the degree necessary to meet the present need.

Need of Ekistics

In order to meet the confused situation in the field of human settlements we need a unified approach. Such an approach is necessary for the following practical reasons:

• human settlements are unique biological individuals, they are entitled to a field of knowledge concerned only with them;
• unless this comes about it is impossible for Man to achieve an understanding of, much less a solution to their problems.

This second point may be argued by those who, following contemporary trends, are in favour of interdisciplinary collaboration. They are right in trying it in many fields including human settlements, but they are wrong if they think that interdisciplinary collaboration alone can fill the gaps which exist in this field of human knowledge. The reason is that we are dealing with such a complex subject that unless the total professional effort of a man over his lifetime is dedicated to the whole, the holistic aspect of human settlements, there is little hope of his becoming an expert in this field. Even if he does so, the road is long and life short. Let us not waste the time we have by trying simply to coordinate the multitude of important but dispersed areas of knowledge.

A simple illustration is necessary to demonstrate how complex the subject is and how meaningless it would be to try to deal with it by the simple coordination of a round table discussion. Settlements consist of five elements which can be studied through many disciplines in many ways. We can classify the knowledge we have about them into five basic categories – economics, social sciences, political sciences, technological disciplines and cultural disciplines. If we make a two-dimensional grid, combining the five elements and the five major categories of disciplines, we see that there are 25 nodal points on the grid, and we reach the conclusion that there are 25 ways of looking at our subject. This is true, but we are wrong if we conclude that there are only 25 ways of looking at the subject (fig. 4).

5 elements and 5 sciences
25 nodal points
1023 combinations of 10 by 1,2,3,4,5
33.554,431 combinations of the 25 nodal points
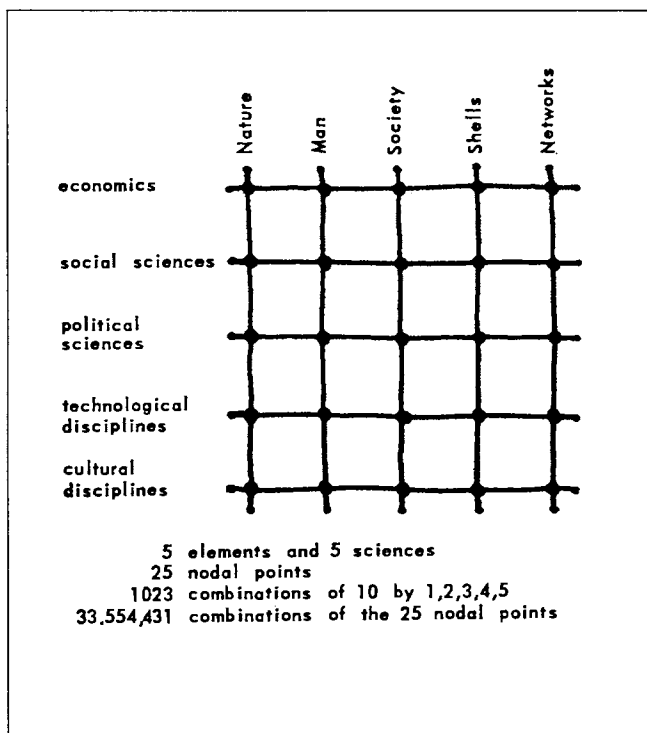
Fig. 4: Elements and sciences in the study of human settlements.

If we combine one element with one discipline, we have 25 combinations. But if we combine all the elements with all the disciplines as we must, then we will have 1,023 or 210-1 combinations. If we assume, though, that the right combinations are those of the nodal points (e.g. Nature studied through economics, with Man studied through political disciplines) we will have 33,554,431 or 1025-1 combinations. All these calculations are based on the existence of one man only. If we consider that there are three people, then we will have 35 nodal points, which means, on the basis of the first assumption 4,095 or 212-1 combinations, and on the basis of the second one 235-I or billions, etc.

It is quite clear that only a unified field of knowledge can save us from complete confusion. This is the field of Ekistics, and it is with Ekistics that I deal in this part of the book, leaving the question of whether it is a discipline or a science and that of its relationship to technology and art for later. Ekistics as a discipline needs a definition of its subject which I have already done, and of its vocabulary and its methods, which I do throughout this book.

In trying to define the goals and objectives of Ekistics, we must decide how we want to face the problem – in terms of the dimensions of the subject, or in terms of its nature, through a certain field of knowledge, or in terms of our own intent. It is quite natural that, at this early stage of the study, we should face certain difficulties in terms of definitions, delineation of subjects, setting of goals and methodology. This is no reason, however, why we should avoid the real issues. At this present stage, we have an obligation to examine the problems even if we may have to refine and even modify our definitions later on. It is only by clarifying our goals at the beginning that we can hope to achieve the necessary progress and evolution of ideas. Our duty is to start a process and follow a road, however faint it may be. The important thing, is to be on the march. It is the fact that we are on the march and that we are aiming towards agreed goals that justifies our effort. It is only natural that while on the march we will constantly re-align our route; later we may even redefine our goals when we can see them more clearly. But what is inexcusable is to forget that we are on the march towards a goal, or to lose precious time discussing unimportant or less urgent issues. We must first define the goals and the general directions we should follow in order to reach them, then start to march. Details of the march can be worked out while we are on the move.

The goal of Ekistics as the study of human settlements, in terms of dimensions, is to develop a system and a methodology:

• to study all kinds of settlements, irrespective of size, location, etc., in order to draw general conclusions about them;

• to study each as a whole, without excluding any of its elements in order to illuminate the knowledge of the field and to solve the specific problems of the settlement under study.

It is only by studying all kinds of settlements that Ekistics can draw general conclusions which can be of importance to each individual settlement. For example, in zoology, it is necessary to study all kinds of animals in order to understand each different kind; only after a general theory of species was developed, could each one be placed in its proper perspective. The following is valid for every field of knowledge dealing with many related items: in order to be complete, it must incorporate all species, from the most elementary to the most developed.

By extending our field of study to all kinds of settlements, we include some which, although contemporary, belong to a different historical era. These can range from settlements which have remained at a very primitive level, as in parts of

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New Guinea and in the most undeveloped parts of Africa and the Amazon basin, to others which have existed throughout the entire historical period of human settlements. These extend our study in time, and help us to understand the evolution of human settlements better.

I must repeat: if we study Man alone or Society alone, if we study the Shells or the Networks alone, we cannot understand the whole subject, which is the human settlement. The role of Ekistics is to study human settlements in a coordinated, interdisciplinary way. Hence Ekistics is a new field of scientific knowledge, comprising the existing disciplines and sciences which study human settlements from their own point of view, and some which have not studied them at all, although they should have done so since certain aspects of the phenomena of human settlements belong to their disciplines. In our endeavour to study Ekistics we must remember that even though we have to study and learn many things, our main obligation is to study the gaps between elements and between disciplines; here is where the weakness lies. If we fill the gaps the whole system will operate as one complex entity in a synergetic way.

By defining the goal of the study of human settlements as the knowledge of all their types, and the approach as an interdisciplinary one, we confine Ekistics to the limits of a descriptive science. This might be enough to satisfy those interested in knowledge only, but it is not enough for those who are interested in creating better human settlements. To enlarge our goal, we must also assign a prescriptive role to Ekistics. Whether this is still within the realm of science, or whether at this point it becomes art, is a matter of further study and definition. At this point it is only important to state that Ekistics must cover both the descriptive and prescriptive aspects of the field of human settlements.

If we assign a prescriptive role to Ekistics, we have to define its goal. The basic goal of Ekistics is to create human settlements which will make their inhabitants happy and secure, as Aristotle expressed it. There have been attempts to define this in many different ways. Gradually, however, and regardless of the viewpoint from which people look at this problem, it is widely recognised today that settlements must be 'human' not only in content but also in quality; they should provide for the well-being and satisfaction of their inhabitants.

This turns us back to statements like Protagoras', who said that, 'Man is the measure of all things'.[6] In our era, we are beginning once again to understand this basic truth, which remains valid in spite of the conquest that has been accomplished since then of wider spheres of the universe through knowledge. John Dewey tells us that, 'Humanity is not, as once thought, the end for which all things were formed; it is but a slight and feeble thing, perhaps an episodic one, in the vast stretch of the universe. But for man, man is the centre of interest and the measure of importance'.[7]

Once we are able to turn our attention back to Man, as the measure of the satisfaction which can be provided by human settlements, we can state that the goal of Ekistics is to achieve the best balance between Man and the physical settlement; Man and Society on the one hand, and Nature and the man-made settlement on the other.

Such a goal raises many questions relating to Man's happiness, well-being and satisfaction. These are difficult questions to answer. May I draw attention to only one aspect of well-being, that of health, in order to show how delicate is the problem we are dealing with. The World Health Organisation tried in 1946 to define health. Its definition covers quite a wide field and raises another set of problems, since it reads, 'Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'.[8] Thus, health alone requires the satisfaction of many human needs, and human settlements must satisfy all these needs plus many others, such as cultural ones.

Such definitions also raise other and different questions: how far does a settlement satisfy human needs, some of which were found in the distant origins of Man while others are contemporary and are changing continuously ? Are we going to set ourselves the goal of satisfying Man as a relic of the past, or Man as he is now developing? Which man do we have in mind? The type of man who is becoming a modern centaur (I refer to those creatures found in many advanced countries that are half-man, half-car), or the man foreseen by Orwell in *1984*,[9] or by Huxley in *Brave New World*[10] or in *Island*[11]? I think that human settlements should satisfy the man who is continuously developing into a better species. Therefore, our aim should be to provide the best continuous balance between Man and his habitat. The more perfect this balance, the greater his satisfaction (fig. 5).

Fig. 5: Man and his habitat consisting of natural and man-made elements.

If we look at our problem from the point of view of Man, the content of human settlements, Man the inhabitant, we will see that the greater his adaptation to the habitat, the greater his happiness. If we look at the same problem from the point of view of Ekistics, we will reach the conclusion that human settlements best serve their objective when they give Man the best chance to adapt to his habitat, provided, of course, that the adaptation is to his benefit.

Therefore, a goal of Ekistics as a prescriptive science is to assist Man in being happy and safe within his settlements by creating conditions of balance between the elements of the settlements, so that he can adapt himself easily to the re-

quirements imposed by the settlement as a whole, and in a way that will help him develop according to his own intentions.

When we set a balance between the elements of human settlements, as a goal for Ekistics, we are dealing by necessity with:

• Nature, which is being spoilt;
• Man, who is changing;
• Society, which is changing;
• the Shells, which must be created;
• Networks, which are changing.

We are creating Shells, but we do not know how much they contribute to the creation of a better Society, better Networks or even a better Man. Only one thing is certain: if we absolve Ekistics from the duty of producing an environment of better quality, we run the great risk of contributing to the deterioration of Society, to the deterioration of Man himself, and to the destruction of natural wealth. Therefore, Ekistics, as a prescriptive science, must aim at creating a balance which will be to the benefit of Man.

Notes

1. Fred L. Whipple, during his address at the Smithsonian Bicentennial, September 1965, as noted by the author.
2. Patrick Geddes, *Cities in Evolution,* 1949.
3. A.E. Brinckmann, *Platz und Monument als Künstlerisches Formsproblem,* 1923.
4. Camillo Sitte, *Der Städtebau nach seinen Künstlerischen Grundsätzen,* 1922.
5. Walter Christaller, *Die Zentralen Orte in Süddeutschland,* 1933.
6. Plato, *Theatitus,* 151E-152A.
7. Loren Eiseley, *The Mind as Nature,* page 36.
8. World Health Organisation, *Preamble to the Constitution,* Geneva, 1946.
9. George Orwell, *Nineteen Eighty-Four,* 1959.
10. Aldous Huxley, *Brave New World,* 1960.
11. Aldous Huxley, *Island,* 1962.

Towards an ekistic theory

Introduction

We cannot limit ourselves to facts, regardless of how many they are and how well they have been collected. Facts alone do not lead anywhere; they are indispensable, in the same way as the foundations of a building are indispensable even though it is the building we need; in the same way as the stones forming a wall are indispensable even though it is the wall we need. In order to reach the final product we need to order our facts in a meaningful way, so that we can build a wall and understand it. We need a theory relating the facts to each other; when we have such a theory, then we have science.

Such a theory does not need 'to unveil the ultimate nature of things' if it helps us build a meaningful whole out of scattered knowledge and in this way understand our subject better; if it helps us to predict its course, and when necessary, to guide it. We need a theory that can connect the facts to form hypotheses, principles and laws, and all of them to form a comprehensive whole which can help and guide us to progress. It does not have to be *the* theory, just one theory which can light our way until we can make the next step and develop a better one. Such a theory has to be based on the observation of phenomena, which lead to the formation of hypotheses which will have to be tested and tried until we arrive at an acceptable theory verified by all our tests and experiments and based on all the facts that we have assembled.

In Ekistics, as in so many other sciences, we can proceed by the inductive method. I believe that many of the grave mistakes which are now being made in architecture and planning are being made by people who thought (or as a matter of fact who did not think but who acted as if they did) that they could proceed deductively. We have to collect and observe as many cases as possible; only then can we induce the laws that govern these phenomena. We can only learn about settlements from the settlements themselves.

To achieve this is difficult since we have not yet organised a system of knowledge, we have not accepted common measurements and scales, we do not agree on classifications of settlements and phenomena and we do not have laboratories or hospitals where many cases are available to us. But this is no reason why we should excuse ourselves from trying to learn about settlements by observing them and inducing their laws.

We do not need to observe just the successful settlements – as town-planning handbooks do – or just the modern villas and sky-scrapers thought by architectural magazines to be the most beautiful or 'exciting', modern and 'unusual' ones; we need to observe all settlements old or new, small or large, good or bad (thus avoiding the danger of subjective eliminations) ; only then can we be sure that we will find the proper principles and laws to be able to formulate a theory and a science.

It may be asked whether we are not acting scientifically today, and if not how we should proceed. I will try to explain this process as I understand it. In dealing with human settlements, we are still acting on the basis of belief and experience – personal or general. Normally, general experience is better. However, there is no reason to believe that what is often called common experience is objective and scientific and not merely the result of some older ideas surviving by inertia, or a total of the incorrect ideas one community has copied from others. Belief and experience are both inefficient and insufficient to enable us to grasp the real issues in human settlements.

It is sometimes said, for example, that the city is the root of the evils of our present condition. But what does this mean? Even if the city were the root of these evils – which is questionable – what do we mean by 'city', and what aspects of it are 'evil'? Is it the size, the shape, the form, the Society living in it, Man who has created it, its economic activities or the way in which they operate? There is no satisfactory answer. It can only be said that probably several of the city's elements and expressions may be indispensable for purposes not necessarily directly related to human settlements. The great size of cities, which to many appears to be the root of the evil, offers many advantages which are unobtainable in smaller settlements. The fact that a large city provides a major centre with a major market for goods and ideas cannot be overlooked when we reflect that a greater variety of exchange leads to a greater variety of choice and to higher intellectual and material goals.

An attempt at a systematic interpretation of these phenomena shows that some of the elements and expressions seem to be inevitable and indispensable, while others may not be. For example, the form of the present metropolis is not necessarily the one best suited to the purposes for which the metropolis was created. Thus in the study of human settlements we should:

- clarify the different phenomena and separate what is essential and indispensable from what is non-essential and can be altered – we must acquire the ability of isolating phenomena in different scales (for example, we might come to the conclusion that the size must increase at a certain rate in order to be beneficial, but that forms of cities and shapes of buildings should be changed in different ways);
- classify all phenomena according to their value and importance to the successful operation of human settlements;

- find out how, by controlling several variables, we can eliminate expressions of elements, organs or parts which do not contribute to the successful operation of settlements (For example, we might create better living conditions in a settlement by re-forming its Shells.);
- ascertain how we can achieve the optimum combination of favourable and unfavourable elements.

Without such an understanding of the real issues of human settlements, we are bound to fail in the interpretation of their phenomena. This can be disastrous when acting to enlarge or modify our settlements. Any action undertaken without the proper conception and understanding of what the settlements are and how we should deal with them, can only be successful and beneficial by accident. It is more likely to work against, than to work for the attainment of our goals. The phenomena of human settlements are too complicated to be faced without an overall theory which can incorporate their conception and interpretation. This is gradually being understood by those seriously concerned with the problem, whether their special interests are related to the physical aspect of settlements, or to social or economic activities. I think it typical that Leonard Duhl, who is a member of the Space Cadet Group in the U.S.A., a private group which is concerned with Man and human settlements, leaves no doubt about the position of the psychologist and some other social scientists when he says:

'Action programs concerned with specific areas executed without a comprehensive theoretical base may be wasteful and even misleading. All groups concerned with the well-being of man, who at the same time either consider themselves scientists or are responsible for the administration of a scientific program, should allocate energy and manpower to the development of such theories.'[1]

The need for a theory of human settlements as the basis for action is indispensable in order to help us:

- properly understand the phenomena of human settlements and consequently develop the descriptive science of Ekistics;
- take action in every field of human settlements and thus develop a prescriptive science of Ekistics, a policy, a technology and an art for their formation.

It may be argued that such a body of knowledge would be better acquired by concentrating separately on each one of the elements – Nature, Man, Society, Shells and Networks. I believe that such an approach to the solution of the problems of human settlements would be completely wrong. In a way, this is what is happening today. There are attempts in each of the fields concerned with each of these elements, at forming theories related to each. These theories are not always of equal value; and even if one of them has great value it is not sufficient to guide the development of entire human settlements. The failure to merge theories into a system has contributed to two situations:

- It has led to the development of a separate approach for every element and the real issue of interest has been treated by these fields only as a side issue. For example, physical geography, concerned with Nature, has not concentrated on relating Nature to human settlements as a whole.

- The disciplines concerned with these elements have tended to develop particular approaches towards the entire human settlement. For example, the approach of the anthropologist is different from that of the planner, which in turn differs from that of the engineer, the architect, etc.

It is exactly this which must be avoided in the future. What we need – and this is the only way of achieving the best results – is a unified approach to the entire problem of human settlements. Only a balanced knowledge of all elements and their interaction in the formation of settlements can lead to a successful theory. Only then can we branch out into more specific fields.

If we look at a diagram showing the five Ekistic elements as spheres and their interrelationships as straight lines connecting them (fig. 1), we can say that Ekistics is concerned with all these lines of interrelationships and especially with the total system of these straight lines, while the spheres are the subject of the study of other disciplines contributing to Ekistics.
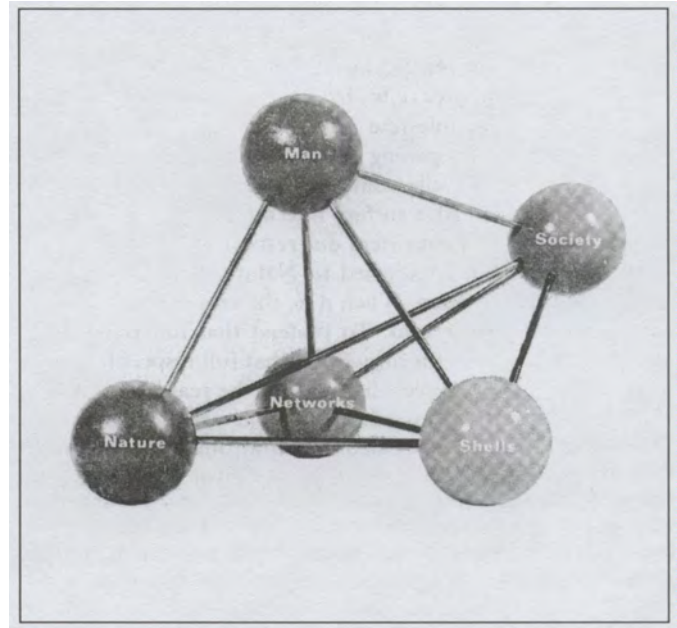
Fig. 1: Ekistic theory is not concerned with the study of the elements by themselves but with their interrelationship.

Once we have a theory of Ekistics, we can proceed with much greater confidence to develop a theory of Ekistics and economics, Ekistics and sociology, Ekistics and anthropology, geography, planning, engineering, architecture, administration, etc. But in order to be successful, such a theory must be part of a broader theory of human and natural phenomena, and must be well coordinated with related theories.

It could be argued perhaps that at the start such a theory must be called a series of hypotheses, for the usual procedure in scientific method is to start with a hypothesis and gradually build up a theory by testing and verifying a sequence of hypotheses. I consider that we no longer need to go through this procedure for the whole theory because:

- even though we have not had an Ekistic theory up to now, we have had Ekistic phenomena for thousands of years; and the total accumulated experience is wide enough to allow us to check on hypotheses and to have an opinion about their validity;
- the phenomena of human settlements are so broad and multiple that the total field of knowledge forms a theory incorporating a number of different principles, laws and hypotheses, and their number will probably increase with time. Thus if some of the hypotheses are proved wrong, there will be no difficulty in changing the larger theoretical concept. I do not believe that such a necessity is very probable for the theory I have tried to outline, but the possibility of some of our principles and laws being inaccurate should always be foreseen, and the theory of Ekistics, like any other theory, will adapt and evolve in the light of experience;
- because of the dangers, even limited ones, of developing an invalid theory, our effort at the beginning should be re-

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stricted to very general principles and laws; since it will be based on general, universal phenomena, observed over long periods of time and in a great number of cases.

On the basis of such considerations I proceed to the formulation of an outline of a theory of Ekistics in two stages, trying to formulate some principles and laws first (in the present chapter) and then to connect them in one basic theory in the next chapter.

Formulation of a theory

How do we build up a body of knowledge to form the principles, the laws and theory of human settlements? One thing is certain: we should separate the objective from the subjective. It is imperative that the body of knowledge to be built up be completely objective and as free as possible from subjective interpretation. This does not dispute the need for strong personal opinions on how to interpret and solve many of the problems of human settlements. To deny this would mean denying the essence of freedom and creative action and the contribution of individual thoughts and ideas. My point is that in order to allow proper freedom of thought and personal creation, we must first understand exactly what the problem is. A great artist only expresses himself in a subjective way after careful study of his subject; he is led to subjective expression through objective study. If this is true of art, which is after all a personal expression, it should be much more true of human settlements, which are not phenomena of personal expression, but which express the needs of a whole Society, formed by the action of the community. Therefore the experts who advise on the problems of settlements should have mastered a wide field of knowledge based on objective facts and leading to a creative expression growing from reason and imagination.

A sound Ekistic theory should assist all who are involved in the intepretation and creation of human settlements. It should be equally helpful to the anthropologist, the scientist, the architect, the humanist, the technologist, the mason, the builder and the artist. It must, therefore, take their experience and knowledge into consideration, but cannot be based on any partial theory related to special aspects of human settlements. There is always a danger that such a theory, concentrating on only one element, will not touch on the heart of the matter, that its lack of focus will mislead it into partial and personal interpretations. So an Ekistic theory must be based on:

- existing settlements;
- extinct settlements known through history or from their ruins (as additional elements of study the settlements of the past can help to shape many parts of the theory, especially those related to the evolution of human settlements and to settlements of minor sizes);
- critical interpretation of the phenomena of these settlements;
- theoretical models, the validity and importance of which should be checked with existing settlements;
- tests and experiments to be carried out in existing settlements, the conclusions of which can be fed back in order to check the theory.

Since it will take time to draw conclusions from the experiments and tests of theoretical models with existing settlements, the theory, at its inception, will necessarily be based mainly on knowledge of existing and extinct settlements and its critical interpretation. The importance of experimentation and theoretical models however, should not be minimised. Although a total reliance on these methods would undoubtedly mislead us at the start, gradually, with increasing experi-

ence, we will be able to rely on them more and more.

A basic question to be answered in relation to the formation of a theory of Ekistics concerns the interrelationship of the different elements of human settlements and their importance in the interpretation of existing Ekistic phenomena as well as the creation of new settlements. In very simple terms this question could be presented as follows: which of the elements should be the basis of our observations and the measure of the others, and which should be adjusted to the others? Should the Shells be matched to the needs of Man, or should Man be adjusted to the requirements of the Shells? Should the Shells be adjusted to Nature, or Nature adjusted to the requirements of the Shells ?

There is a tendency – usually unconscious but sometimes conscious – to give a rather one-sided answer to such a question. Many people creating settlements today would answer that the Shells should be adjusted to Man. But I do not believe those people fully understand the implications of such a statement, for in practice many architectural and engineering solutions are adjusted only indirectly to the expressed needs of Man, and in fact, impose on him Shells for which he has expressed no desire.

There is much talk about the need to adjust architecture and buildings to Man, because, the argument goes, we pay more respect to architectural forms and structural regulations than to the unexpressed desires of Man. What we should really find out is what Man needs and what can serve him best. We should not always regard the prevailing as important and try to perpetuate the existing situation because it requires the least intellectual effort. On the other hand, we should not overlook the fact that a great part of the settlements we will have to deal with throughout our lifetime already exist and, even if we believe that they are unsatisfactory, we cannot change them overnight. So even though it is necessary to find out the real needs of Man, we cannot easily implement solutions which will meet all his requirements. There are also people, especially medical doctors and social scientists who are prepared to give greater importance than is necessary to the opposite statement—that Man should adjust to his habitat for his own happiness. While this is true-for the immediate future (because unless Man can adjust to his surroundings, he will be unhappy) there is no need at all for Man to retain his habitat just as he has inherited it, because this may not serve his needs best, and because he is in a position gradually to change it.

In building up a body of knowledge on human settlements we cannot regard any principle derived from existing human settlements as the sole criterion of the phenomena we are trying to interpret, describe and understand. Personally, I believe that, to some extent, each of the positions mentioned above is valid. Man by necessity adjusts to his natural environment and has to respect its basic characteristics; he cannot disregard the formation of the ground and the natural landscape. On the other hand, he can respect these characteristics only to the degree that they are related to the forces he is developing and to the degree that he cannot change them for his benefit. For example, a nomadic settlement's adjustment to Nature is practically 100 per cent, since nomads interfere with Nature only by utilising grazing grounds. Farmers, however, interfere with Nature by cultivating a certain part of it, by opening paths, by building various small Shells. And urban dwellers interfere even more drastically by transforming the Earth's surface into a man-made landscape. The real issue is to what extent due respect is given to Nature at every level. Man is adjusted to Nature, but Nature must also be adjusted to Man. When it is, the ensuing balance will mean a healthy settlement. To pretend that full respect for Nature would supply the answer, or that full respect for Man

only is the answer, implies disregard of the real issues. As an example, the first case would mean that where swamps are found, they must be respected and Man must live in them. In the second it would mean that any form of Nature and pattern of life found in an area may be upset for Man's sake. This means that if Man does not want to climb, we are entitled to level off any landscape utilised for human settlements. This is unrealistic from both the financial and technological points of view; also it means working against Nature, which has already had a pattern of life developed on it. In the long run these two views, the latter of which is often supported by those responsible for development – some building contractors for instance – only lead to disaster for Man himself: in the end all wrong solutions for the total settlement work against Man, its founder.

Much the same can be said about the relationship between the other elements, such as that of Man to the Shells. The Shells have to be adjusted to Man. But there are certain characteristics of the Shells today, such as their large dimensions and new traffic requirements, which create new conditions for Man; in these respects Man must become adjusted to the Shells. When one floor is placed on top of another and people are obliged to climb stairs, we cannot say that we are adjusting the Shells to Man. In this case, we are adjusting Man to the Shells. When one must take an elevator and be closed in a box for several seconds or minutes in order to climb to the top of a multi-storey building, again it is Man who is adjusted to the requirements of the Shells. The final question in all these cases is: what is the best balance between Man and Shells in a changing settlement? We know by now that it is not simply a matter of adjusting the Shells to Man or Man to the Shells, but of attaining the best balance between all the elements and then between the elements and the entire settlement. This is the basic criterion which should guide us in formulating our theory.

The present body of knowledge of human settlements is based mainly on the past natural development of human settlements. By this I mean development which was never abstractly conceived and implemented in order to be tested in actual life. Development can be called natural when it is based on the desire of Man to serve those of his needs he considers intrinsic through the most direct means. When he wanted a shell over his head, he selected a cave. When he thought that he could build a shell he tried a beehive dome, which was the only way he could then cover the small space needed for his hut. Gradually he attempted to transform this through other types of construction. In every case he sought a desirable accommodation, conditioned by his conception of what could be done; he always tried to build the possible. From time to time he probably attempted the impossible as well, and failed. History does not record the failure of Man in building his settlement, except in a very few instances when great monarchs tried wild schemes which failed but still exist because of their great investment in stone and brick. These failures, however, strengthen my point that the main line of development leading to our present-day settlements was natural.

Most of the principles and laws of human settlements which can be developed today could well be called the natural laws of human settlements, and they will continue to be valid unless some day it is proved that with abstract methods we can evolve other laws that are more beneficial to Man. When this happens, they can be added to the Ekistic theory. Personally, I have great doubts as to whether abstract laws will ever upset the validity of natural laws. Through abstract methods we may reach new types of solutions, but this will not affect the natural principles and laws of Ekistics, if they have been properly conceived.

Principles and laws

Facts are connected in meaningful ways in order to lead to conclusions of more general significance and with validity for a certain number of cases having common characteristics. These meaningful ways have been given different names, depending on the schools of thought which introduced them, on the acceptance of their findings, the chronological order of the reasoning, etc. Such are the postulates, the 'common notions' of Euclid, the axioms of Aristotle. Several of them have been called principles and laws but there is no general agreement as to which one is which, and when a principle turns into a law. I will not enter into these discussions and I will deal with only three terms, *hypothesis, principle* and *law.*

Hypothesis is, chronologically, the first consideration in a meaningful process of inducing general conclusions from specific facts. At the beginning it does not provide sufficient evidence and remains therefore a tentative explanation. A hypothesis is tested in several ways, especially by experiments. If it passes the test successfully and if it fits into a broader system of ideas, it becomes a valid hypothesis and may be accepted as a principle or law. A *principle* or *law* follows a hypothesis. They are accepted hypotheses since it has been found or proved that the statements which they contain remain unvariable under the same conditions.

I do not believe that at this early stage of our effort to formulate a theory of Ekistics we need to enter into a discussion of the differences between all these statements (this may or may not become necessary at a later stage) and therefore I limit myself to the use of the term *hypothesis* to mean statements which need to be validated and *principle* or *law* for those statements which I believe have been validated, either by 'common sense' which after all is the basis of science, or by special explanations which appear in this study.

Efforts have been made at times in the past to state laws about settlements but they were never systematic and seldom accurate. When I was a student I learned that 'all major cities grow towards the west' which was definitely inaccurate, although it could be reasonably accurate for some north-western European industrial cities where industry was based on coal and therefore the best neighbourhoods, in their attempt to avoid the smoke, moved west, away from the prevailing winds. It is now commonplace that a city should grow in the direction of the areas of greatest attraction and minimum resistance and these can be found at any point of the horizon.

The principles and laws needed as a foundation must have an indisputable validity, since they will form the central body of our theory. They should, therefore, be based on as much experience and as many examples as possible. Thus, these principles should:

• have a general validity regardless of the period of human settlements under study;
• not refer to phenomena drawn from only one category of settlements.

They should cover as wide a spectrum as possible and should not be limited to a single period or to one species. Laws about villages will by necessity have a much greater validity than those concerning dynamic settlements. We cannot express opinions about the laws of the megalopolis, since it is only now beginning to take shape. Neither the natural evolution of human settlements nor experimentation can help us today with the megalopolis. We will need time to formulate its laws and we must devise as many models as possible to help us do so. At present we must simply observe and record the data of these new phenomena and proceed carefully on the basis of what we know and what we can demonstrate (fig. 2).
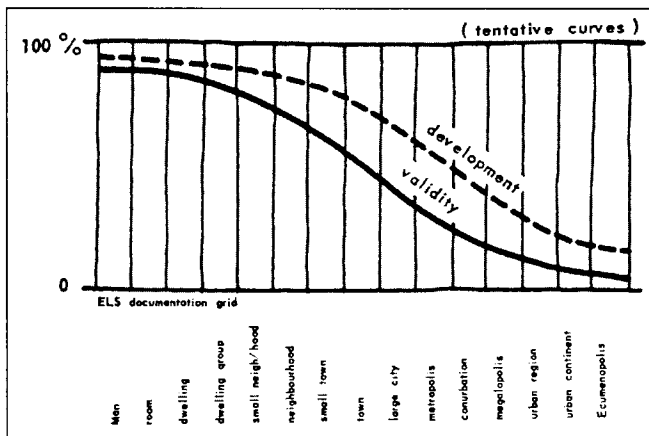
Fig. 2: Validity and development of Ekistic laws in relation to the available historical number of examples.

Fig. 3: Validity of predictions about basic Ekistic phenomena in relation to the size of the unit.

If we are to formulate laws about human settlements we have to ask ourselves what their nature will be. We have to decide what kind of laws we are talking about. Which, out of the multitude of phenomena, are we going to select in order to express the common characteristics of settlements. I think that what we should expect of all laws is that they be:

• true,
• helpful,
• general, and
• simple.

It is obvious why they have to be true and it is understandable that they have to be helpful; any effort to develop a law correlating the age of the citizens with the age of the city, for example, would be pointless, if it existed at all. For similar reasons laws have to be general; we could not possibly be interested in a theory about the existence of a law relating the orientation of the settlements of Java with their size. And they must also be simple, since we cannot expect to develop laws with many terms at such an early stage of our endeavour. When we have a satisfactory system of laws then we can proceed to more detailed and more complicated ones. Even so these laws will have to be true and helpful.

We can have many kinds of laws; they can be divided into laws of elements (connecting two of them at least), or laws of the whole settlement, relating it perhaps with some of its elements.

The first laws that we can develop seem to be causal laws, as, for example 'lines of transportation attract other functions, such as houses and buildings'. We have the cause – the road and its function of transportation; and the effect – the attraction of other functions. If we look at any map of a region in the macro-scale we will recognise the truth of this law. It would, however, be wrong to assume from such statements that the Ekistic theory can be a theory of causality.

Causal laws have to be exact and valid always. 'Every line of transportation attracts other functions', is not exact and not always valid. If the line has just been built, then there has been no time for the attraction of any function. We must qualify the law adding 'after a reasonable period of time'. Moreover, it does not attract functions if they are not related to the transportation line. A railway does not attract the farmhouses, they are primarily attracted by the best farmland and only to a secondary degree by a transportation line.

On the other hand, if we look at the micro-scale of a settlement we will notice that pedestrian paths may not attract other functions, if they are not meant to. As a conclusion we can say that settlements as large units and in a macro-scale
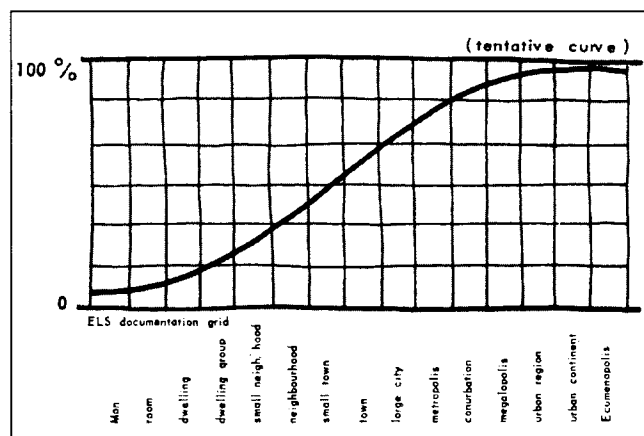
seem to follow a deterministic type of law of cause and effect; but this does not *always* happen, and not at all scales. To make this statement true we must know all the factors influencing the location of functions attracted by lines of transportation, and discover their influence on these functions; only then can we formulate a law of cause and effect that is always valid.

Since such a procedure is not possible we are forced to say that large units usually do follow laws of cause and effect, but that we are unable to determine their totality to such a degree of accuracy as will allow us to formulate these laws in a scientific way.

In practice we have many causes and forces to deal with. In such cases we are much closer to the laws of chance and effect. Our previous law will come close to reality if formulated as follows: 'most lines of transportation attract other functions which are related to them'. In this way we are avoiding grave mistakes – such as taking the statement to mean that tunnels, for example, or transatlantic cables, attract any functions and we are qualifying the functions as 'related'. This law can be elaborated even further: 'most lines of transportation on the surface of land attract other functions which are functionally related to them'. This, in practice, is a law of chance and effect.

Thus, we reach the conclusion that the Ekistic laws are much closer to the laws that modern science in general is following. From the days (in 1927) when Heisenberg introduced in physics the principle of uncertainty, to the theory of games developed by von Neumann, to the theory of statistical differences, modern science is moving on a more realistic road, describing phenomena as they are regardless of how probabilistic this description may be.

If we now think of individuals who are one of the elements of settlements, and their movements, it will be obvious that we can foresee their actions only on the basis of the laws of chances, and if we try to predict their actions only statistical laws can help us.

Whether we start from settlements in a macro-scale or in a micro-scale we will find that their laws are statistical laws. They are laws of approximations, with greater validity for greater numbers of phenomena. It is easier to foresee statistically the movement of people in major arteries of a metropolis than their stroll in one of its small parks. In this respect, the validity of our predictions increases in the larger Ekistic units (fig. 3) unlike the validity of our laws about settlements (fig. 2) which were based on the knowledge which we have about them.

On the basis of these considerations I proceed to the formulation of Ekistic laws based on our experience and divided into three groups. The first group refers to the life cycle of human settlements, regarding them as species which are born, develop and die. The second group refers to the internal balance of human settlements and the third to their location, structure and form.

I have numbered these laws not because I consider that this is necessarily their order – although a reasonable ordering has been attempted – but mainly in order to introduce a proper system of reference.

Laws of development

Creation

Law 1. A human settlement is created in order to satisfy certain needs expressed by different forces, needs of both its own inhabitants and of others.

If a certain group of people needs to produce food for its own survival, it is attracted by an economic force to an area where food can be produced; there it settles, serving its needs in the best way. The need is for food, and the force connects the producer with the locality of production.

However, there may be an area of many villages which need a market or administrative centre to serve them all. As a result, a corresponding urban settlement will be created in the area best serving all the villages. The need is the provision of services to others, and the force is an economic one connecting those providing services with the best locality for this purpose.

Law 2. Following the creation and operation of a settlement new functions are added which had not been foreseen, and consequently the settlement has to satisfy the initial as well as the additional needs. The more it grows the more important these additional needs may become.

Even though a settlement may be created as a marketing centre for the villages of the area, it may develop industry, administration, cultural institutions and other functions, which, once created, are not at all lacking in importance as compared to the original ones, since the settlement has to satisfy all the needs of its inhabitants and of those others served by its inhabitants. At first these needs are structural ones being added to the initial functions by the structure. With the passing of time they become functional needs themselves and lead to the creation of other structural needs.

Law 3. The ultimate goal of a human settlement is to satisfy the needs of its inhabitants, and of the others it serves – particularly those needs leading to happiness and safety.

So we come back to Aristotle. Twenty-four centuries of human experience have brought us to the same old truth. The *ultimate goal* is happiness; and happiness cannot exist unless it is coupled with safety, for otherwise it is deprived of the fourth dimension of time: the concept of future happiness and consequently the feeling of happiness itself is lost.

Law 4. The satisfaction of the inhabitants cannot be ensured unless all their needs – economic, social, political, technological and cultural – are largely satisfied. There is a unity of purpose in the creation of a settlement; it cannot fulfil Law 1 if it covers only a few of Man's needs (fig. 4).

When one category of these needs is not satisfied, there cannot be full satisfaction, and the system is an unstable one tending towards destruction.
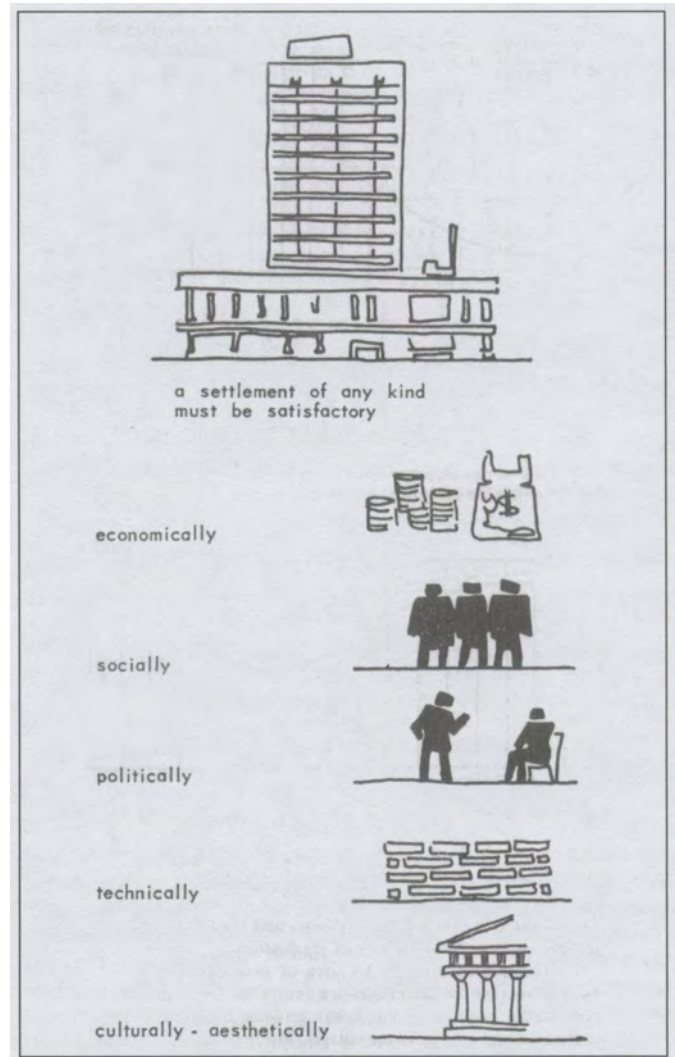
Fig. 4: The unity of purpose.

The balanced satisfaction of human needs is not only indispensable for the existence and survival of the settlement; it is also necessary for the satisfaction of its inhabitants in their everyday life. Consciously or unconsciously, people are dissatisfied when one aspect of their needs is not covered. Let us assume that in a mud-brick village somebody manages to build a marble house. Such an act will upset the pattern of the village from every point of view. Economically, it will be an unwise action because the economy of the village cannot stand a house so different. Socially, it will create trouble, for one person will be trying to live at a much higher level than the others. It will also have internal political repercussions. Technologically, if such a house is built by the villagers, it will be of poorer construction than the mud-brick houses since these people know how to build the latter but not the former. Finally, there will be no aesthetic adjustment to the requirements of marble, no proper expression of marble construction (no builder adjusts to a new material overnight), and the house itself will disrupt the aesthetic unity which had prevailed in the village.

The claim that economic criteria are the only ones of importance in Society cannot be supported where human settlements are concerned, unless one manages to express in economic terms all values of interest to the settlement and to all its elements. This means, for example, being able to express the practical and aesthetic values of the settlement's

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landscape as well as Man's connection to the landscape in economic terms. The same holds true of a work of art, or of the aesthetics of a street.

I spoke of unity of purpose, and gave it the meaning of unity between the settlement's elements. But this is not the only meaning and the only expression of unity in settlements. We must think also of the unity throughout the space covered by human settlements, from the smallest to the largest unit. In the building of a settlement a unity of purpose can be found in the serving of all its elements and in the serving of all its units, large or small, throughout terrestrial space. When we are building a house or a room, or merely putting one stone on top of another, we are only soldiers in a great army of builders. We must bring Man and his environment into balance, a balance we have lost in our age. We must understand this basic unity of purpose, and thus relate the house to the town and the town to the countryside. Within this framework we must build roads and villages, and in turn relate these to the central town and the towns further out, ending up with a conceptually comprehensive Ekistic system covering the whole Earth. The reason I use the word 'conceptually' is that many times a pattern will express itself without a specific project, for quite often there is no need for one.

Law 5. Human settlements are created by their inhabitants and their existence depends on them.

This principle raises several questions. First it may be asked why the settlement is created by the inhabitants themselves. Do we not know of cases where the settlement has been created by external action, such as the decision of a ruler, or an industry, or a central government? This is true. Although the great majority of settlements are created by their own inhabitants, there are some which are created through external decisions and actions. If this action ultimately corresponds to the will and ability of those who will inhabit the settlement, it will be successful and will survive. If the opposite is true, there is no hope for the survival of the settlement, unless it is turned into a prison in which the people are forced to remain. Such a thing might happen, but it will not represent the typical case of a human settlement. It is an extreme case of an external force imposing itself on the inhabitants of the settlement not limited to problems of the settlement, but extended to the conditions of their freedom and way of life.

A question may be asked concerning the initiative the technicians involved in the creation of the settlement can have. Regardless of the authority which undertakes the creation of the settlement, how about the action of those who must plan, design, finance and build it? Our principle still holds valid, for if the technicians through their action express the deeper will – conscious or unconscious – of the inhabitants, their decision will be respected and carried out, not only during the phase of creation, but also later during the evolution of the settlement. If the experts do not create a settlement which can satisfy the basic needs of the inhabitants, the settlement will either be abandoned or altered – the latter if the difference between what the experts have done and what the inhabitants need is related to structure or form of the settlement involved. Only when the experts have the full backing of the community can the settlement have a normal period of gestation and a normal birth for only then will it have those strong chacteristics which aid it in its early life.

Law 6. A human settlement is created only when it is needed, and lives only as long as it is needed, that is only as long as there are needs expressed by forces strong enough to justify its existence.

When cattle-breeders are obliged to stay on a mountain for a short period, they build their huts with branches or, if there are no available materials for their shells, they pitch tents. When farmers have to cultivate new land a long distance from their villages, they must build their own shells, be they temporary or permanent. An urban settlement which serves a port or an industry is born and grows together with the port or industry, and the same happens with a settlement at an important crossroads in the country.

The moment of birth is determined by the needs created in a certain location. If these are not sufficient to justify its creation, the settlement will not come into existence. This means that there may be a need for the creation of a new market centre to serve several villages. The economic force, however, which is exercised on a new central location may be very weak because of the distances involved. In such a case a new settlement cannot be created even though there is a need for it. The economic forces are not strong enough to counterbalance the needs of such a new settlement, that is, the income is not high enough to justify a sufficient number of inhabitants.

Development

Law 7. The development and renewal of human settlements is a continuous process. If it stops, conditions leading to death are created; but how long the actual death will take depends on many factors.

A settlement is a living organism and must develop continuously (fig. 5). This development is related to all its elements: Nature, within which it is created, changes. Man and Society
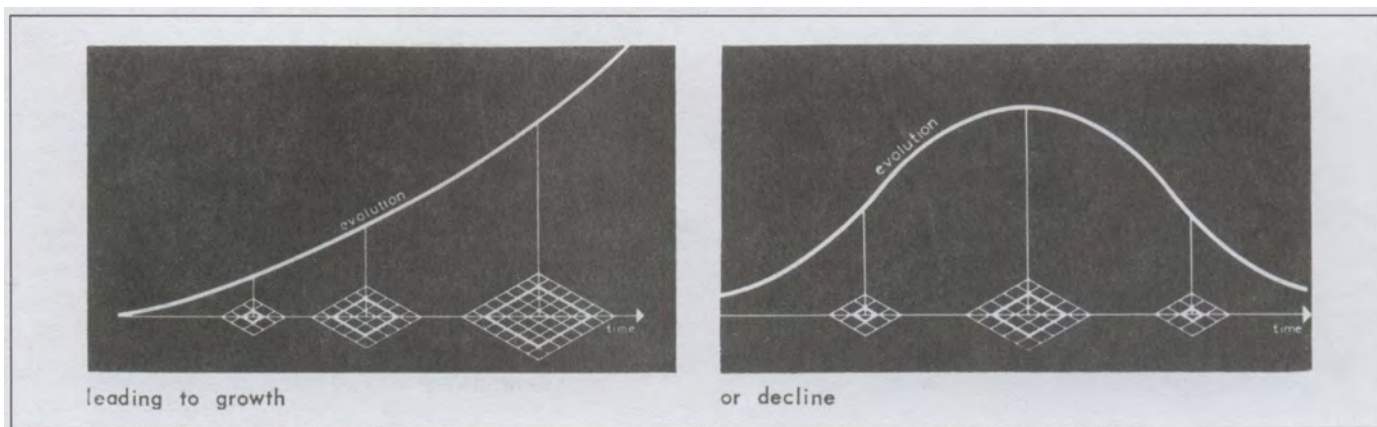

leading to growth   or decline

Fig. 5: The development of human settlements is a continuous process.

develop, and the Shells and Networks change correspondingly. Even if there is no change in appearance, the moments which are added to the life of the people, the movements they make within the settlement, the leaves which grow or those which fall, the changing quality of the texture of houses under the sun or rain – are all changes of the entire settlement. Man, Society, Shells and Networks age – therefore, in a living organism they must be replaced; otherwise, they will recede, and only Nature will gain, recovering the ground lost through the creation of the settlement.

Law 8. The potentiality of a human settlement depends primarily on its location and the whole Ekistic system of which it is a part. These same factors condition the type and size of the settlement at every period of its life.

If a settlement has been created because there was a natural harbour next to it, this settlement will survive as long as there is no larger port near enough to take over the role of the first harbour. If the settlement has been created at a crossroads, it will survive in the same form and size only if the converging roads are not transferred and a new, more important crossroads created. If the settlement has been created as a commercial centre, it will survive until some nearby commercial centre takes over the market it has been serving.

As with all living organisms, the capacity of a settlement for survival depends mainly on its ability to meet competition with similar species, a competition for survival in the same space. If it is a cattle-breeding settlement, and the grazing ground all around is turned into farming land, the cattle-breeding settlement will cease to exist; its Shells may be either eliminated or transformed. If it is a farming settlement producing vegetables and fruit for a nearby city and this city ceases to exist, the settlement cannot survive; it will probably have to grow and market other products which can be transported over longer distances to other cities, which means a different role and probably a reduction of its population. If it is an agricultural settlement within a non-mechanised farming area, it will soon be absorbed by the other settlements which will be economically stronger and will manage to buy up its lands. In each case the survival of the settlement depends on its relationship with the surrounding area and the Ekistic system.

Law 9. The total investment of economic, social, cultural, and other values in a settlement depends at every period of

its life on the potential of the settlement itself, and on the broader role it can play in its system, since both condition inside and outside investment.

Normally, a settlement which is built to provide shelter for farmers and their families should correspond to the investment proportionate to their total income. The total value of investment should be in balance with the other needs of the inhabitants, such as for food, clothing, education, entertainment, etc. It is possible, though, that a government interested in cultivating an abandoned or new area and drawing farmers into it, may offer them more extensive facilities than those normally corresponding to their income. In such a case the additional expenditure will be borne by a wider area, eventually by the entire country (or even by other countries). This will be undertaken because of the broader benefits a wider area will gain from such additional investment. In this case, the Ekistic system is supporting a weak settlement for the benefit of the whole system.

The same is valid for other types of human settlements. The economy and total potential condition the value of investment. This is especially true when a settlement is completely isolated and has grown by itself. However, when it belongs to a system covering a broader area, region, nation or the whole Earth – as is usually the case – certain external forces, depending on its role in the broader area, are added to its own forces and potential. A national government may well create army settlements near it for defence purposes, better administrative centres in order to compete with neighbouring areas, or institutional welfare settlements for the rehabilitation of depressed areas.

However, over longer periods and in a wider Ekistic area the first part of Law 8 which states that the total investment depends on the potential of the settlement itself, is valid. Even though for a few settlements, and over a short period of time, investments can be larger than the potential, this is impossible for most settlements over longer periods because the total balance of economic forces would be lost. So, we are led to a broader definition of the same principle: the total investment of values of all kinds in Ekistic regions depends on their own potential. Variations of this basic law will exist only in a rather limited time and area.

When settlements are born and grow without planned action, there is a continuous adjustment of the effort made for additional investment to the needs and potentialities created.
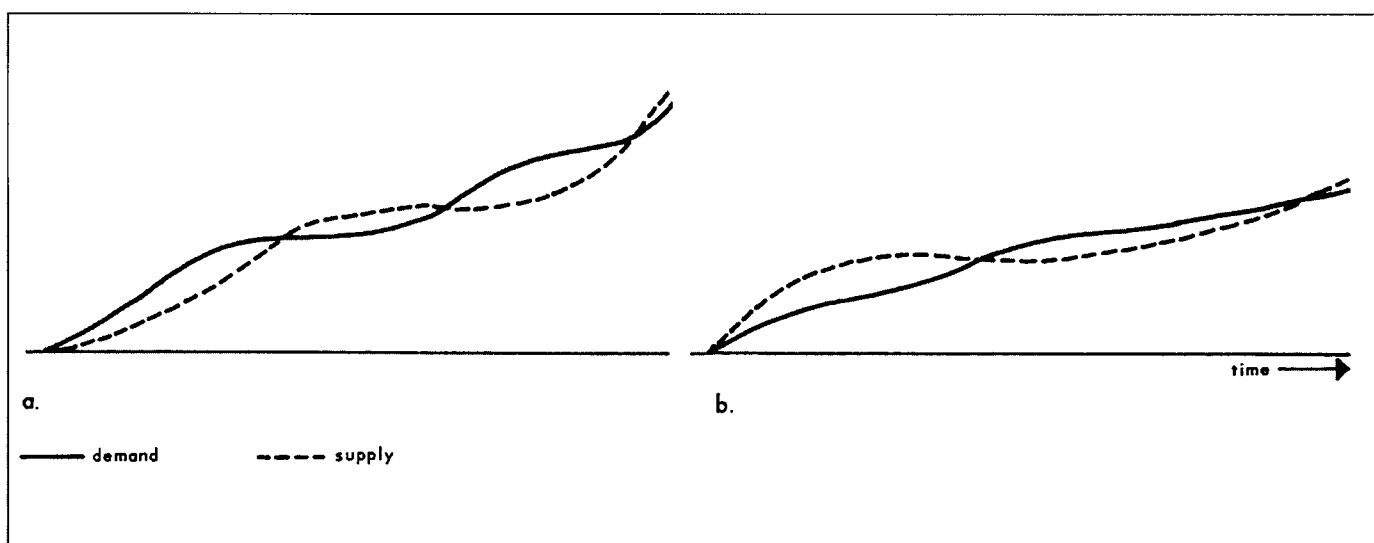

Fig. 6: Relationship between demand and supply in natural human settlements.

In general, there is a relative similarity between the curves of demand and needs, and the curves of the supply of facilities. In these settlements, demand precedes supply. If this lasts over a long period, however, it is probable that supply will catch up and may even precede demand, in which case, if it precedes it beyond a certain limit, it will slow down, waiting for a new growth of demand (fig. 6a).

When settlements are born or grow on the basis of planned action, it is easier to make mistakes in the estimates, and there may be over-investment or under-investment at first. Such action can have a great impact on the life and development of a settlement. Over-investment may have a negative effect because it will mean small results in relation to expectations. This may well mean disappointment among the people who created the settlement and might lead to its abandonment or to a reduction of the necessary effort for its maintenance and functioning. Under-investment, on the other hand, may slow down the normal flow or normal increase of the population (fig. 6b).

Law 9a. Investment in each part of a settlement depends on the forces being exercised on it.

If the forces are only dependent on pedestrian movements then the investment will be in shops and other facilities of interest to pedestrians; if they are dependent only on trucks then we should expect storehouses. If they are forces of cars at very high speeds passing through a non-access highway then there may be no investment on the side of the highway.

Law 10. The values created within a settlement, in addition to the initial needs leading to its creation, act as a secondary force contributing to its speedier development; or, in case of depression, they slow down or even arrest and reverse its decline.

It is quite possible that a settlement created as a harbour town cannot survive when the harbour suffers from nearby competition. If important factories have also been created within the harbour town, let us say during the period when boats were made of timber, this settlement may not be able to survive as a harbour in the era of steel ships; on the other hand, it may well survive as an industrial settlement, based on the timber industries which had been established in it. In such a case, it may lose the percentage of its activities and inhabitants corresponding to the purely commercial activities of the harbour. But if the competing harbour is within commuting distance and the initial settlement has developed important residential facilities, the latter may also survive as a residential suburb of the new harbour settlement. Or perhaps, if the residences and workshops created during the period of timber boats have historic or cultural-artistic value, the initial harbour town might become a tourist or cultural centre.

On the other hand, even if the settlement does not face a decline because of the elimination of some of the causes which created it, but has a normal period of life ahead of it, because of the primary reasons of its development, the fact that it has created additional factories, residences and other functions of some value will attract even more people and thus encourage its further development (fig. 7).

If the initial settlement is agricultural and the primary causes of its creation change – let us say that a large urban settlement is created close-by which grows and takes over the farms of the agricultural settlement – the values already invested in it may determine whether it can survive and in what form it can do so. If its farms have not been irrigated and the land value rises, they will easily become building plots. If on the other hand, its land has been irrigated and intensively cultivated, its transformation into building plots will be delayed

the existing settlement

one possibility : the new centre causes the decline of the old settlement

grid 20 x 20 km

another possibility: the existing settlement survives and grows together with the new one
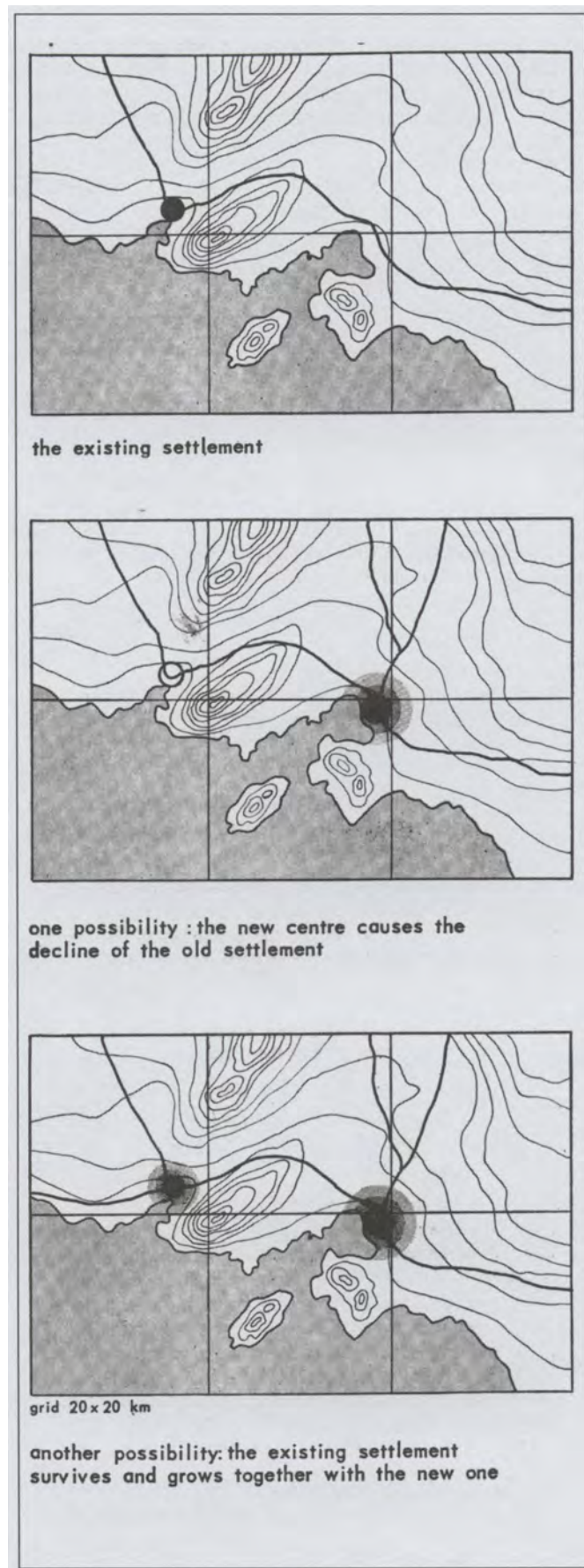
Fig. 7: Impact of a new centre on an existing settlement.

and the settlement may even be able to survive as a truck gardening island within a metropolitan area (fig. 8).

If the investment in the built-up part of the village is small in comparison with the urban investment taking place around it, when the farms are turned into building plots, the Shells of the village will be easily eliminated and replaced; but if the

1st phase : the agricultural settlement

2nd phase : the expanding city gets closer

3rd phase : alternative a : the city absorbs a part of the agricultural land

3rd phase : alternative b : the agricultural settlement resists because of intensive cultivation

4th phase further stage of alternative b: the urban investment overruns the intensive cultivation turning the farms into urban plots

5th phase : the agricultural settlement is completely eliminated by the advancing city

grid 2 x 2 km

Fig. 8: Elimination of an agricultural settlement by the expanding city.

value of the village Shells is great, either from the economic or cultural point of view, it may not be eliminated, but be incorporated into the metropolitan area.

***Law* 11.** In a growing system of settlements the chances are that the largest settlements will grow faster than the others.

This is a basic law of dynamic systems; because of the reasons already mentioned in the evolution of settlements the larger ones attract greater and more functions and grow more than the others.

***Law* 12.** The per capita cost of a settlement increases (other conditions, such as income, being equal) in proportion to the services provided by it and the number of its inhabitants.

In order to show the validity of this law, both parts of it must be explained. I will begin with the first. In order to understand the truth of this state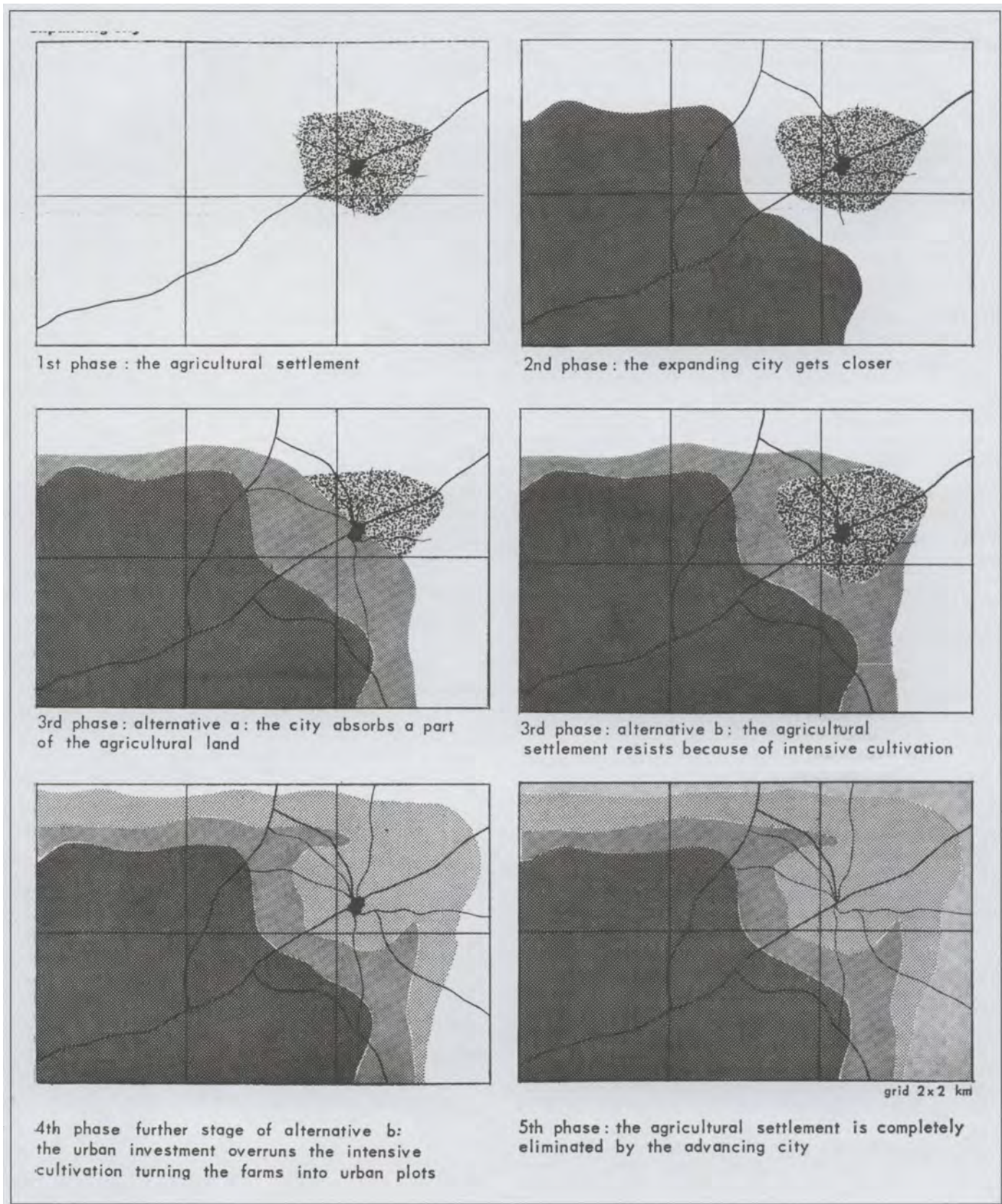ment, we must consider how equal types of services could be provided within several different settlements. If the settlements are of the same size, but the services are increasing in one of them, it is quite natural that these services will become a very heavy burden for the same number of people. If, for example, one out of a number of equal settlements builds a large hospital which serves the inhabitants of only that particular settlement, the burden may become too heavy for these inhabitants, because had it been bearable, it is probable that similar hospitals would have been created in all settlements of a similar size. This is why where a service of a higher order is necessary, the majority of people must live close enough to it to be willing to split the cost among them. This is most economic if other people come into the same settlement because if they live in different settlements, the cost of the total settlement will be higher per capita. A greater number of people will bear the cost of the hospital; but because of the longer distances between them and the institution, the total cost is going to be higher than it is when everyone lives close to it.

We must now show why the cost of a settlement increases also in proportion to the number of its inhabitants regardless of the services provided. Let us take a simple example of a water supply network. If this network supplies a certain number of gallons of water per capita to a settlement of 1,000 inhabitants, it needs only narrow pipes. But if this settlement has 10,000 inhabitants, not only would the narrow pipes of the distribution network be needed to supply all of them with the same amount of water per capita per day, but some mains would also be necessary to bring the water for the distribution network into the communities of 1,000 inhabitants. This water main is an additional cost which must be borne by all the inhabitants. For them, the per capita cost for the supply of water increases because they inhabit a major settlement, although the quality of the services provided is exactly the same. In this case, it is not the facilities provided which increase a settlement's cost, but the number of people they serve.

***Law* 13.** Time is a factor necessary for the development of settlements. As such it is inherent in settlements and is physically expressed in them.

The fact that settlements develop in time compels them to respect certain rules. When, for example, the central square of an old city was originally given certain dimensions, it was not done with the initial number of inhabitants, which could be very small, in mind but the number which the original inhabitants thought that their city would eventually attract. This was quite easily expressed in static settlements, for the element of time in development did not influence them to a very considerable degree. It becomes a much more critical and impor-

tant problem, however, in dynamically growing settlements. In some of their elements the time factor has been taken into consideration, as when a certain width has been given to highways to permit them to bear heavier traffic in the future. But this is valid only up to a certain point beyond which the calculation does not allow for more traffic; therefore, a conflict is created between the highway's design and the demand for higher traffic capacity. The conflict is even more considerable in terms of the shape of cities still considered static without recognition of the fact that they are actually growing dynamically and that the whole city must expand at a high speed. The fact that this basic principle has been overlooked in the present-day cities means that they suffer from the pressure of the three dimensions expanding in time with no space to cover their additional requirements. The Shells are too static to serve the needs of a dynamically growing organism. The 'snail' is growing too quickly in its static shell, an event of tragic significance for dynamic human settlements (fig. 9).
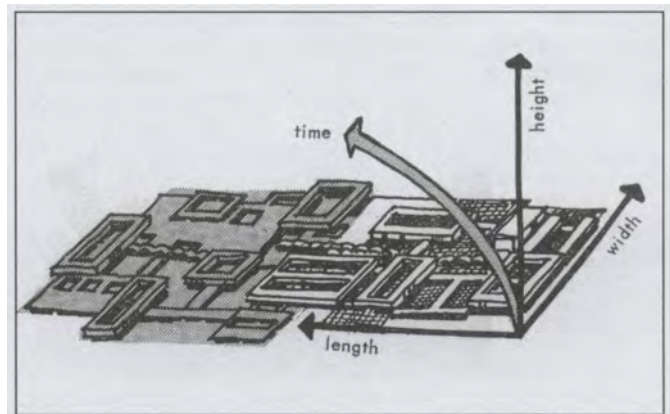

Fig. 9: The fourth dimension.

***Law* 14.** Time is not only necessary for the development of settlements, but also for their existence. Therefore, time, along with the three physical dimensions, becomes a fourth dimension, indispensable to the settlement.

The fact that we walk in a street gives it dimensions proportionate not only to the three physical dimensions of Man, but also to the fourth. If Man could run as fast as a horse, the streets would always have had to be wider and their crossroads and turnings completely different; and if Man crossed the streets at the speed of a bullet, the streets would have had to be straight and the crossings on different levels.

The same holds true for the expressions given to the architectural details of the Shells. For example, because Man walks in the streets of a village, the walls, the doors and windows of the houses are appropriately painted and decorated. When Man moves at the speed of a car, there is no need for the kind of external street decoration which has been in use for thousands of years. The architecture of the settlement where Man moves at his own speed is different from the architecture on a highway. This is another expression of the fourth dimension of time as a factor used by Man in human settlements.

Extinction

***Law* 15.** The gradual death of a settlement begins when the settlement no longer serves and satisfies some of the basic needs of its inhabitants or of Society in general.

A settlement connected with a port begins to die as soon as the port loses some of its traffic; a portion of its population can no longer survive and decides to move, taking certain values with it. In such a case men are the first to move to a different location, and then the values created by them, if they can be transferred, follow. A work of art can be easily transported, while a building, especially one having no artistic value, will be demolished if the site is needed for another purpose, and abandoned if it is not. Even local traditions may be transferred, though they will change during such a transfer; but such things as the trees in the central square of a village, the elements of Nature under which such cultural values and traditions have been created, will necessarily remain in the same location.

***Law* 16.** In the death process of all or part of a settlement, no investment is eliminated unless its value has been amortised from the economic and cultural points of view, either because of changes within it, or because of changes in the system to which it belongs.

Under normal conditions no investment is eliminated unless its value has been amortised from every point of view. But there may be cases where this is not valid, due perhaps to the decline of the entire system to which this settlement belongs. In such a case the decline of the system or a part of it, may mean the decline of a settlement before its values have been amortised. If, for example, a new city has been created as a market centre for a rural area and needs 30 to 40 years for its amortisation, it will not decline before that period. If, however, the whole rural area is abandoned for some reason, then the city which had been its market centre cannot survive on its own and will decline despite the fact that the investment in it has not been amortised. The case of the need for urban renewal in many cities is a similar one. In the past, a house was not demolished unless it was fully amortised. Today many houses may have to be eliminated even though they are not amortised, if the whole area in which they belong has declined for some social, political or other reason.

***Law* 17.** In the death process of a settlement its elements do not die simultaneously. The same holds true for the values that it represents. As a consequence, the settlement as a whole has much greater chances of surviving and developing through renewal even if some of its elements are dying.

The five elements of a settlement last and live for different lengths of time. This means that if one element dies, the others may cause a regeneration giving the settlement the power to continue living. This is made even stronger by the fact that every element does not consist of one unit only, but of many; consequently, the death of a few houses, or inhabitants, or trees, is not felt by the settlement as a whole since other houses, inhabitants and trees continue to live.

The same principle holds true for the different aspects of life represented by a settlement, i.e., economic, social, political, and so on. All these aspects can be satisfied for periods of different length. A settlement may be amortised from the economic point of view in fifty years, and from the social point of view it may be able to survive for one or two centuries, while from the cultural-aesthetic point of view it may survive for even longer (fig. 10). Thus several aspects with a longer survival value carry the ones with shorter survival values over longer periods and the settlement continues to exist beyond initial expectations.

***Law* 18.** During the process of death, inertia caused by existing forces plays a very important role in slowing down the process.

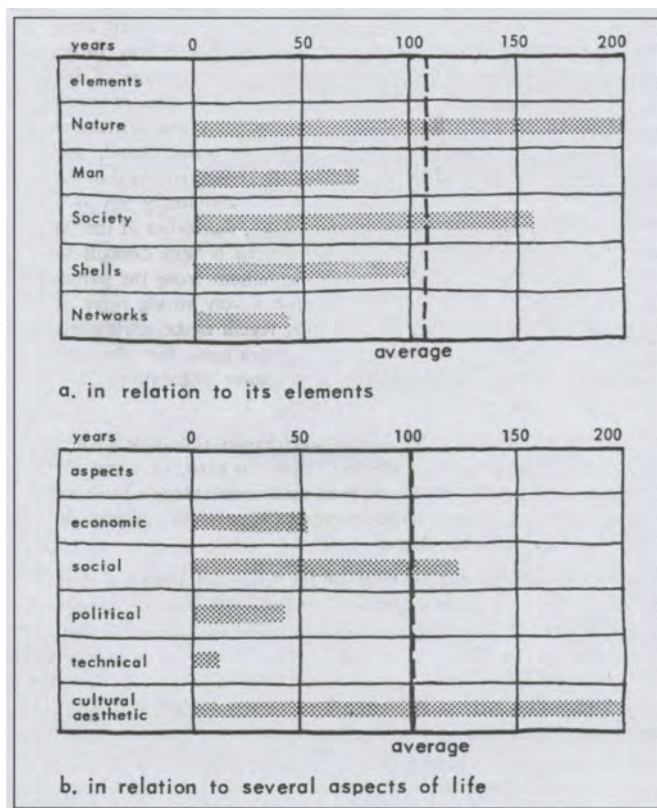When the reasons for the employment of people in a city

Fig. 10: Life expectancy of settlements.

cease to exist, some of the younger people tend to abandon it. Yet the fact that a lot has been invested in good housing and other facilities may keep many people there for a much longer period. A man could move into other settlements to look for new employment, and his family be left behind to make use of a comfortable house and good community facilities until he has been successful enough in the new settlement to provide his family with corresponding facilities. So, the Shells of the community act as a very strong force of inertia. This may even have the effect of reviving a declining settlement, since, during the period when the forces of inertia are operating, new functions may be added to the settlement and a part of its population may be attracted back, allowing the settlement to survive the crisis and live again (Law 17).

The settlement may also develop forces of inertia because of the Shells' capacity to survive for some time even if they are abandoned. While first the productive and then the nonproductive forces of the population may abandon it, the Shells of a settlement which have not been demolished have the capacity to survive for several years, perhaps several decades. During such a period the fortunes of the settlement may change once again and new forces may flow in.

So, the forces of inertia slow down the decline of a settlement and delay its death, first because only one part of the population leaves while another part stays behind for quite a long period; and second because even when the entire population abandons the settlement it still retains the values of the Shells, and even dead, the Shells develop forces of inertia.

The value of the Shells determines the strength of the inertia. If the settlement is temporary, with Shells consisting of tents, the forces of inertia will be nil, since when nomads decide to move to a different location, they take their tents with them. If the Shells are permanent, but of low value, not only absolutely but in relation to the income of the people as well

(since perhaps they have had no time to invest enough in accordance with their income) the settlement will be easily abandoned. If, on the other hand, the people, although of a low income level, have remained in the same location for centuries, not only individually but as a community, and the investment is high, the forces of inertia will be much stronger. In such cases, it is very difficult to disassociate the existence of the settlement from the values invested in it, for the latter exercise a very strong force of inertia over their population. Such forces make settlements last not only for decades and generations, but also for centuries although perhaps with fewer inhabitants and functions, and a smaller capacity.

Law 19. The death process of a settlement is complete when every reason for its life has ceased to exist, or when the facilities it provided have been made available in a location which can be approached more easily, or which can provide them to a higher degree.

This means that in spite of the forces of inertia a time will come when the settlement can no longer provide enough for its inhabitants, at least not as much as a new settlement nearby provides, and this induces even the people who were kept behind by forces of inertia to abandon the Shells, which then die.

As long as the Shells have a relatively high value, the forces of inertia are strong and people develop a certain resistance to movement. But when investment in the new settlement and opportunities for life are of higher value than the total of opportunities provided by the old settlement, the latter can no longer survive and is abandoned. In very exceptional cases such settlements are maintained as dead Shells, not by the communities, but by the broader areas interested in them, especially if they have great historical or cultural value; an example of this type of settlement is Williamsburg in the U.S.A. However, in such cases they are given additional life and very often are completely revived and become settlements of even greater importance than before, just because of the values invested. In these cases the Shells have survived and have caused the creation of a new type of life within them. If the settlement had been completely abandoned and no interest had been shown in it, its death would have been final.

Before closing this section containing the first basic laws I would like to point out that these laws are valid only if Man and Society do not take action to reverse them. When I say, for example, that settlements die under certain conditions, this means that Man and Society have not reacted to the ongoing forces in order to save the settlements. This, we should not forget, constitutes the basic difference between the laws of organisms in nature (animals and plants) and laws of settlement where the thoughtful decision of Man can change the course of their development in a revolutionary way.

The course of the life of settlements can be conditioned by their laws if Man does not consciously intervene. This leads us to the last law of this section.

Law 20. The creation, development and death of settlements follow certain laws unless Man decides to reverse their course.

The question whether he is able or wants to is one depending to a great extent on the laws themselves.

Laws of internal balance

Law 21. The elements in each part of a settlement tend toward balance.

If one of the elements gets out of balance, within reasonable limits, the settlement tends to re-establish this balance. If this

can be done in time, the settlement is normal again. If the loss of balance is so extensive that the settlement cannot re-establish it within a reasonable time, the results may be disastrous. When, for example, the population of a settlement grows very quickly and there is not enough shelter for everybody, this leads to the creation of more shelters; should this happen within a reasonable period of time, the settlement will move ahead normally. But should the gap between demand and supply for more shelter be too great, the settlement will definitely begin to suffer, perhaps producing many undesirable effects.

When balance is reached the settlement is satisfactory and orderly. Balance should exist at all times. But overall balance is not enough; it should prevail in each part of the settlement, in each Ekistic unit. If it is limited to the general framework only, the units of a lower order will be in need of redevelopment and renewal.

Law 22. The balance among the elements of a settlement is dynamic.

Since we have noted in Law 7 that the development of a settlement is continuous, we cannot expect the elements to remain in constant static balance. As each of them changes, and in accordance with Law 21 tends to regain balance, we can also expect the balance to change and become dynamic. A population increase means an increased demand for housing, educational institutions, facilities, social institutions and functions; higher incomes mean more complicated functions, and greater investment in the Shells.

Law 23. The balance of the elements is expressed in a different way in each phase of the creation and evolution of a settlement.

In the first phase of creation there is a different balance between Nature, which is the controlling element, and Man, who constitutes the one element added from the outside. The balance in the first phase is dynamic, with Nature playing the greater role. Man must begin to understand Nature, transform and control it. In the next phase Man manages to impose small, probably temporary, Shells on the landscape. He then expands these Shells. It is quite clear from these examples that a different type of balance exists in each phase of creation.

Law 24. The balance between the elements is expressed in a different way in each section and at each scale of a settlement.

This dynamic balance is reminiscent of the Heraclitan philosophy of constant change. We can therefore say that settlements continuously find themselves in a Heraclitan state, while they are tending towards an Aristotelian one.

This balance is expressed in one way in a room, where Man alone is the controlling factor and the Shells are the only other major one. It is different on a highway where the function of traffic is preponderant, where Man is an element under the control of another element, the car, and where Nature is practically altogether absent. On a larger scale, in a whole community, on the other hand, Nature – expressed first by the landscape and then by the climate – plays a much greater role; and on the metropolitan scale the landscape may become the most important factor, influencing even the form of the settlement.

In the past, human settlements were built on the human scale only. Their only inhabitant was Man (and domestic animals) moving at his own speed. Recently, and especially

since the beginning of the twentieth century, first the car, and then the airplane and rocket, have entered the life of Man, imposing new scales and new problems (fig. 11). The car in par-
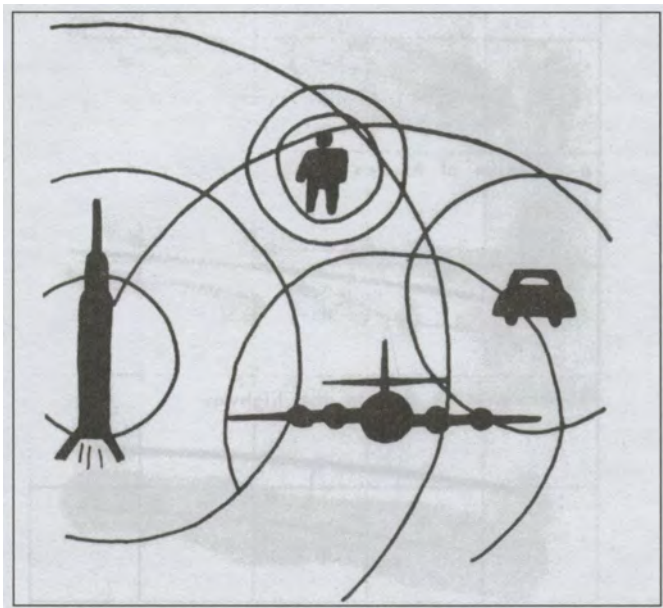
Fig. 11: Many masters and many scales but balance must be established in every scale.

ticular, existing in cities made for Man, ruins their texture, cannot itself move freely, and creates many problems for Man. For this reason, one scale for every kind of inhabitant is the only natural solution for settlements. Man used to have full control; the car has displaced him in various scales and has taken control. What is wrong is that Man is still interfering with the scale of the car, while at the same time he has not succeeded in saving his own scale outside his buildings.

This is the reason why scale is of major importance where human settlements are concerned, and why in Ekistics forms have no importance at all unless they are specific expressions on a specific scale. I will mention one example (fig. 12a). If we take some Ekistic units – houses with their plots – and distribute them along a minor road, their inhabitants will be connected with each other by small lines which are either vertical to or parallel to the small road crossing the settlement; they all form a small community. If we now widen the road and turn it into a highway, and leave the houses as they were (fig. 12b), a community will no longer exist, since people will no longer be connected to each other across the highway, which due to its width and traffic has ceased to connect and acts as a dividing element. This is why the first so-called 'linear city' of Madrid by Soria y Mata, 1882, could not have succeeded; the design of its elements was completely out of scale. The great width of its main street and its street-car-line destroyed the unity of the small community with one- and two-storey houses. Cohesion was impossible.

In order to re-establish cohesion between these houses, we should consider two rows of them with a small street in between as one Ekistic unit, and should then build the highway outside this unit in order to allow it to retain its scale (fig. 12c). In this way, more Ekistic units could be created around the highway and a larger Ekistic unit would emerge (fig. 12d). These minor Ekistic units could then be enlarged without touching the highway, which will form the spine of the greater community (fig. 12e). The result would be the same as with the first houses along the small road, the difference being that instead of houses we would have cohesive communities

which are small units connected to a major community by a major highway. Synthesis in space is expressed in different ways in accordance with the scale of the Ekistic unit.


a. cohesion of houses along a small road

b. no cohesion due to the highway

c. cohesion along a small road parallel to the highway

d. cohesive patterns along the highway

e. cohesive communities along the highway

grid 100 ⊼ 100 m

Fig. 12: Creation of ribbon development.
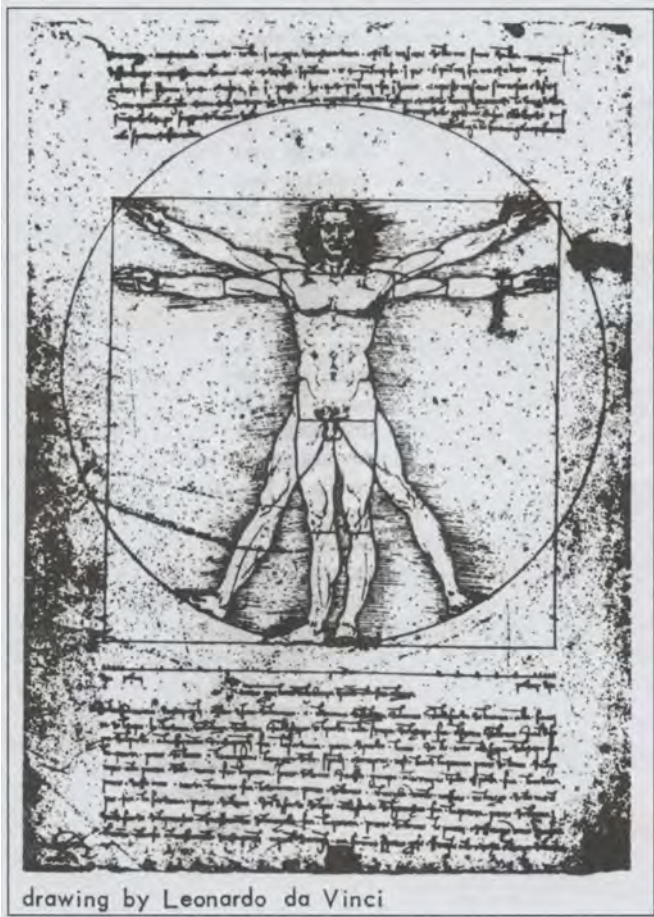
Fig. 13: The human body as defined by the body of Man.

a. standing

b. sitting

c. reclining

d. walking
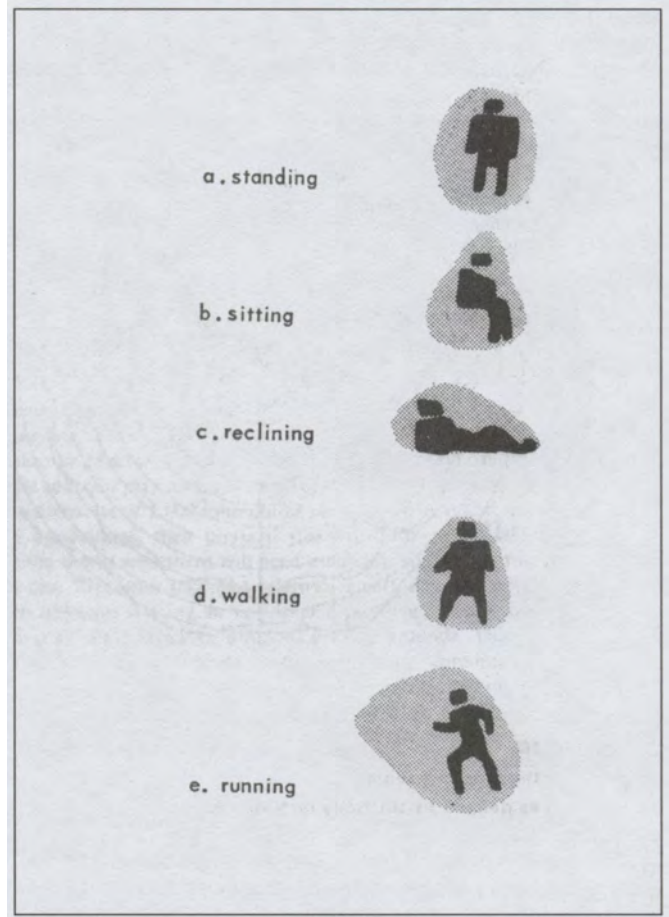
e. running

Fig. 14: Single human bubbles as defined by the body of Man.

Law 25. The most important balance of all the elements in space is that of the human scale, which is fully controlled by Man through his body and senses.

The human scale begins with the space required by Man in his movements, which for all practical purposes is in the shape of a bubble with a diameter equal to Man's maximum dimensions when he stands with his arms extended horizontally. The drawing of Leonardo da Vinci, although drawn for another purpose, is the best representation of the average dimensions of this bubble (fig. 13). Naturally, its size changes from man to man, and even for the same man, since his position in space, his movements and his speed change, and the bubble changes accordingly. When he is sleeping, for example, the bubble is elongated and flat at the bottom. When he is walking, the bubble is an elongated spheroid which is rather elliptical on a horizontal plane with the longer axis parallel to the direction of his movement. When he is running, this spheroid is even more elongated (fig. 14).

The complete study of the human scale cannot be limited to the static human bubble as represented by Leonardo da Vinci. We must look at it in two ways. First, Man does not consist of a body alone; the complete Man has body, senses, mind and soul. The real human bubble consists of many bubbles radiating in different ways around Man (fig. 15).

Second, Man does not stand still. This is why Leonardo's drawing alone is misleading and we have to show it side by side with the moving man, who not by his dimensions alone but by his movement as well defines the human
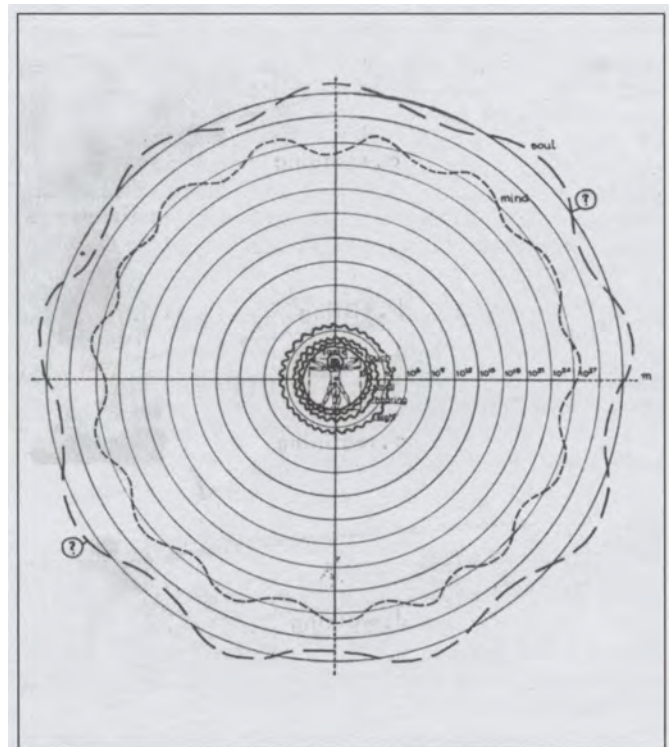

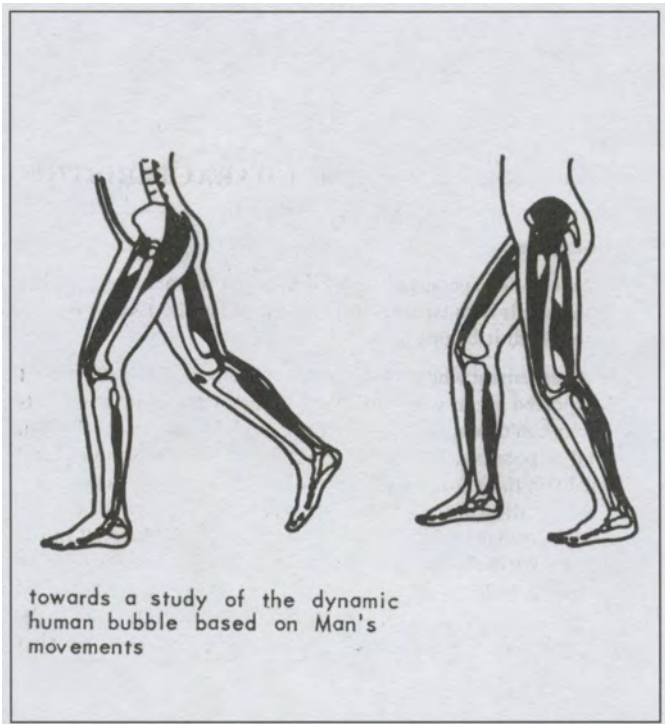**Fig. 15:** The total system of human bubbles as defined by total Man.

Fig. 16: The human bubble as defined by the body of Man.

order imposed by a spectacle

disorder when the spectacle is over
the bubbles shrink

further shrinking of the bubbles

a new order created.

Fig. 17: Combined human bubbles.

scale (fig. 16).

When we understand the single human bubble and the scale it imposes properly we can proceed to combine many of them in different ways, depending on the conditions and the forces which are being exercised on them (fig. 17).

This human bubble is the smallest unit we deal with in Ekistics. Its normal dimensions in a horizontal projection are between two and three square metres (21-32 sq. ft.) depending on the size and the position of Man. The next unit is the room; then come the house, the dwelling, the group of dwellings, the small neighbourhood. These units increase up to a certain size, beyond which we begin to lose the notion of the human scale. The limit is, as practice has shown, a unit corresponding to the ancient cities and to the urban distances Man likes to walk today. Both lead us to believe that such a unit has a radius of no more than a ten minute walk, which means a maximum diameter of 2 kms, or an average of 1,500 metres or just less than a mile. This distance coincides with the distance from which one is able to see a building of impor- tance, which may be located at the centre of a community. This is the distance over which Man can easily have a visual aesthetic grasp, the area which he can easily comprehend with his own senses. It is up to this scale that Man is in full control, a control which decreases from the smallest Ekistic unit, the room, to the larger one of the community (one mile long). His control decreases at a higher rate beyond this limit.

Laws of physical characteristics
Location

Law 26. The geographic location of a settlement depends on the needs it must serve for itself and for the Ekistic system to which it belongs.

A settlement whose role is to be a transportation centre must be located in an area which all kinds of transportation
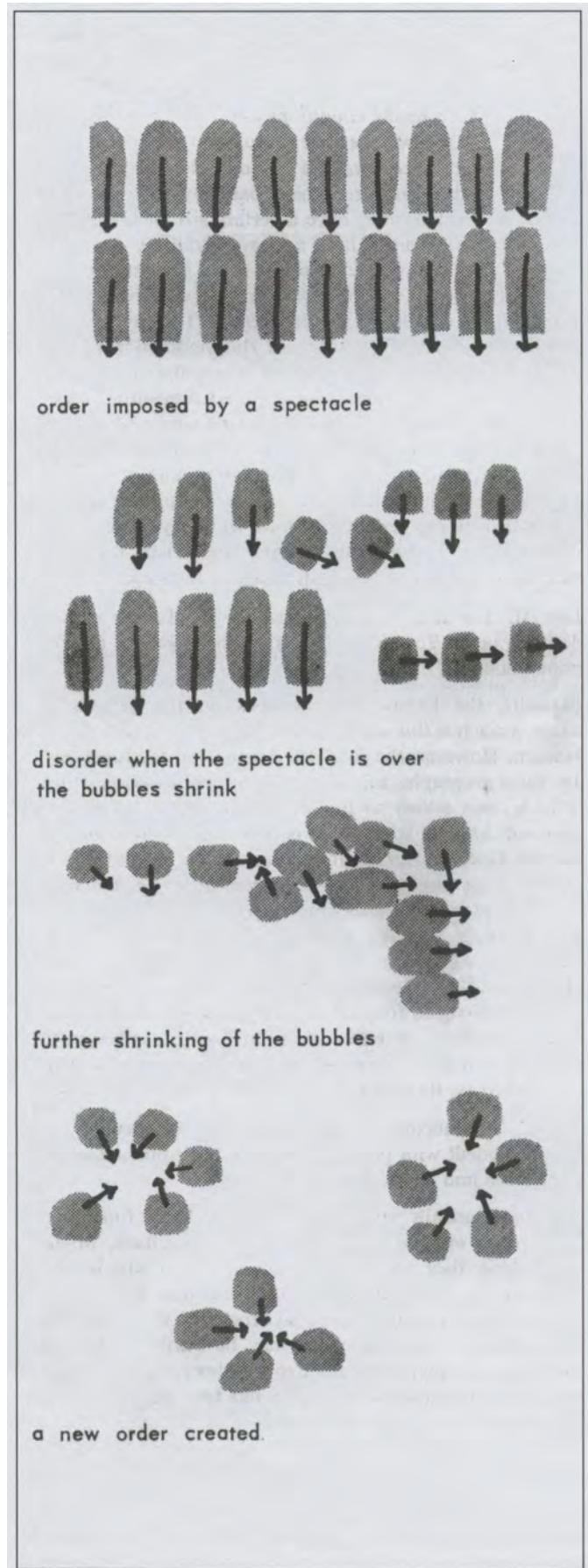
networks can cross; near the sea or on a plain with as much open land as possible. But the geographic location does not depend solely on the natural formation of the area. It also depends on the formation of the Ekistic system. A settlement which is to be a main transportation centre must not only be located in the proper natural setting, but also in a key position in relation to the whole system of settlements. For example, if all settlements are coastal, the transportation centre should be near the coastal region's centre of gravity, and not near that of the inland plain, where only small and unimportant settlements are located.

Law 27. The topographic location of a settlement depends on its needs and its physical size. If a settlement must cover the need for a port, it will be drawn by an economic force to a neutral harbour.

If the size of the settlement which is to become a port town is very small, it can be located on a hill near the port. But, if the settlement is large, only a plain near the harbour will give it a chance for proper development. The dimensions of the settlement determine the selection of the topographic site.

Size

Law 28. The population size of a settlement depends on its role in servicing certain needs for its inhabitants and for its Ekistic system.

Needs and the forces which express these needs determine the size of a settlement. In our era a settlement is no longer an independent organism separated from others. At the beginning of Man's history there used to be relatively independent settlements, self-sufficient and located at great distances from other settlements. This type has by now been practically eliminated, or is in the process of being so. Today the size of a settlement depends on its geographic and topographic location, which conditions its Ekistic location (i.e. its location within a broader system), which in turn conditions its role as a part of it. Any attempt to understand the size or any other basic phenomenon of a settlement by disassociating it from the system of which it is a part will be misleading. The belief that the size of settlement D can be disassociated from its whole system is erroneous, for it is quite clear that the population of D depends on its role in the entire Ekistic system (fig. 18). The same is true of any small settlement A1. Its general role is that of a class A community, and consequently its population is conditioned by this class A location. In addition to this, its specific location in the proximity of D, in spite of the fact that its primitive function was the same as A2, leads to a greater population than A2. A1 has been brought into closer contact with a major settlement, from which it absorbs the capacity of new functions, which leads to a different population size.

We do not know much about what happened in the past and whether there were any conscious attempts to limit the size of settlements, or of cities in particular. We have reasons to believe that the size was limited in most cases by the population itself. The very fact that in many cities people built walls and managed to live within them over long periods of time implies that the population size of the settlement was confined by the limitation of its physical size through walls. Because of all the existing conditions in our era of dynamic settlements, we know of many efforts made either in theory or in practice to limit the dimensions of settlements. We know equally well that these efforts are doomed if they overlook the fact that the settlement can and must grow in accordance with the requirements of its Ekistic role. If its functions in their evolution do not require a larger population, then the population is limit-
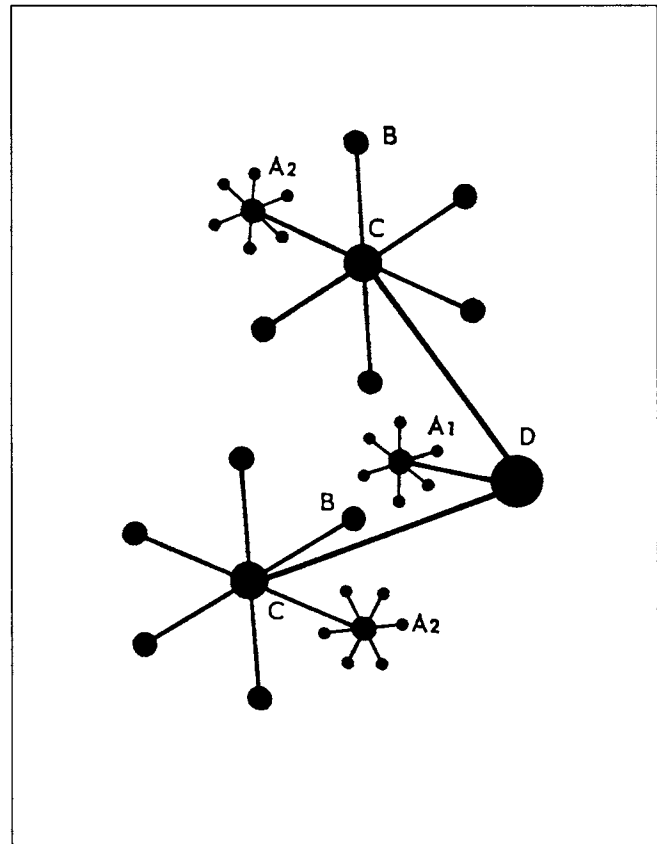

Fig. 18: Population size of settlement D is a result of the connections within a whole system.

ed to what was originally thought possible. If, however, the functions in their evolution require a larger population, there is no reason to believe that any human force can set a limit to the size. No political or social system of the present era has proved to be stronger than the force of economic activities and the Ekistic system, which in the final analysis defines the population size of every settlement.

Law 29. The physical size of a settlement depends on its population, its needs, its role within the Ekistic system and its topographic location.

Whereas the population size depends on the functions of the settlement and its Ekistic role, the physical size is influenced by various factors. The size of the population is the first and deciding factor, but the functions of a settlement and its Ekistic role can play a very important role as well. If we have two settlements of 1,000 inhabitants each, one urban and the other agricultural, their physical size will differ immensely, since the urban settlement will need much less space than the rural one. The latter might be relatively small, if the farmers live by intensive farming, or very large if they live by extensive farming or cattle-breeding and need grazing grounds. This is valid both for the total settled part, i.e. the entire community area, and the nucleus or built-up part. A farming community of 1,000 people with a very large area can have a built-up part as small as an urban community, or perhaps even smaller if the whole community lives on dry-farming and there are no cattle to be housed in the built-up part. On the other hand a farming community where the cultivation is in-
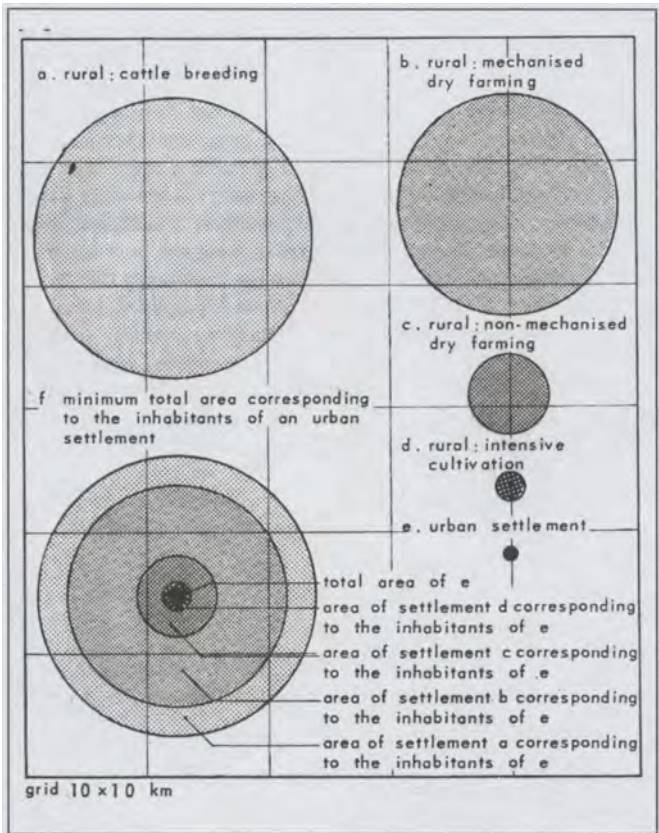
Fig. 19: Physical dimensiions of settlements of 200 families.

Fig. 20: Climate effects upon the physical layout in a coastal area, Paros, Greece (1961).

tensive, may have its houses built on the farms, making the built-up area much larger than that of the dry-farming community (fig. 19).

The physical size also depends on the topographic location and many local factors – from climatic to cultural – linked with it. A windy location may force a settlement, be it urban or rural, to be very densely built in order to mitigate the heavy winds (fig. 20). On the contrary, if it is a very hot area and the winds are an important factor for a better micro-climate and better living conditions, we may then witness a completely different community structure tending towards a much less dense pattern in order to allow for ventilation (fig. 21).

Functions

Law 30. The functions depend on the geographic and topographic location, the population size and the Ekistic role of the settlement.

The geographic location determines the general functions of a settlement, such as its function as an agricultural or industrial centre, while the topographic location conditions these functions more specifically. If the geographic location allows for agricultural production in general, it is the topography which finally conditions the produce of the area.

It may be asked whether the population size determines the functions, or vice versa. It is quite clear that on the contrary it is the functions which basically determine the population size. However, once a certain size of population prevails, the settlement by itself acquires additional functions because of that size. For example, a small industrial centre is created because of the required function of serving a big new industry in a large agricultural region. The city acquires a population of 10,000. Because of this population it now plays the role of a
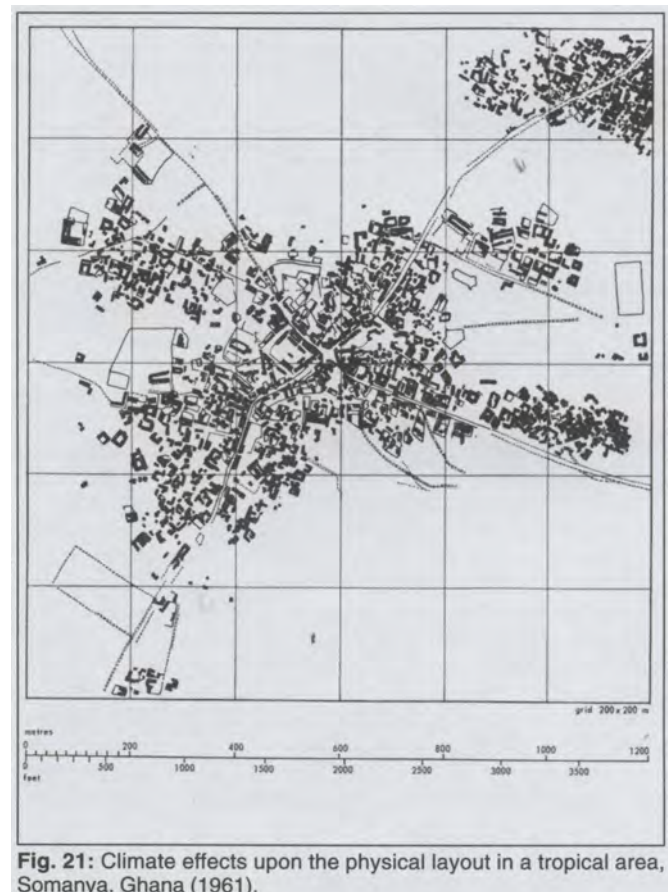

Fig. 21: Climate effects upon the physical layout in a tropical area, Somanya, Ghana (1961).

small urban centre serving the surrounding area, for unlike the villages which existed previously, it has certain facilities which can serve the whole surrounding area much better. Such additional functions, conditioned by the population size, draw additional population, and so on.

Finally, the Ekistic role conditions specific functions. If an urban settlement has certain functions, let us say if it acts as a commercial and administrative centre, its Ekistic role as a class D or E centre conditions its specific functions.

Law 31. The role of a settlement in the Ekistic system depends on its functions, its geographic location and its population size.

Basically, the Ekistic role depends on the geographic location, since it is this which conditions the basic class of the settlement. However, the role also depends on the functions. In the same geographic location an additional function which may have been added to the settlement because of special local conditions or a decision concerning the role of the settlement (such as turning it into a military, administrative or educational centre) also conditions the Ekistic role. Finally, the population size which has been reached because of the functions of the settlement adds to its Ekistic role by changing and reclassifying the settlement within the whole system, if new functions have increased the population. A class C settlement, for example, can play a class D Ekistic role if the functions established because of government decision add a pop-

ulation which may change the Ekistic role and increase its importance.

Law 32. The functions and Ekistic role of a settlement are interdependent with geographic and topographic location, population and physical size.

Although basically several of the physical and functional characteristics of a settlement determine the others, in the final analysis they are interdependent. For example, the population size may depend on the functions, Ekistic role and physical size, but the latter also depend on the former. In these relationships greater value may be attributed to one factor or group of factors than to another; this is why in some of the previous laws, emphasis has been placed in only one direction. However, there is no relationship between these physical factors and functions which is not reversible. The relationship is merely more basic in one direction than in the other.

Because of these relationships, each of the six factors already mentioned in Laws 26 to 31 – that is, geographic location, topographic location, population size, physical size, functions and Ekistic role – forms a circle within which all possible connections are justified to different degrees. There are no missing links between the circles; some of them are simply stronger than others. The radiation to and from every one of these circles represents one of the previous six laws while the total stands for the law of interdependence (fig. 22).
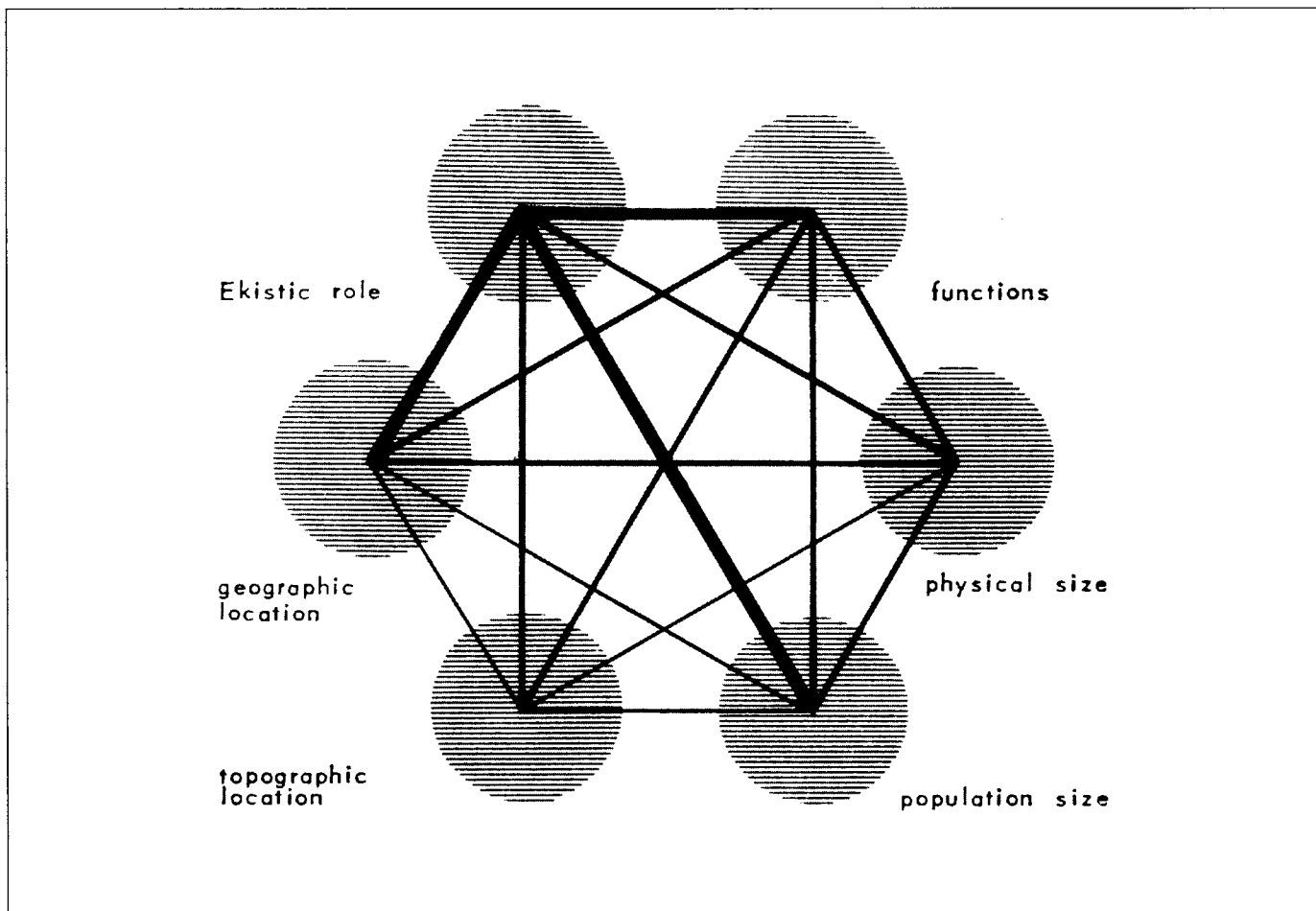

Ekistic role

functions

geographic location

physical size

topographic location

population size

Fig. 22: Interdependence of factors and functions.

Structure

Law 33. The basic cell of human settlements is an Ekistic unit which is the physical expression of a community. This unit should function without being fragmented in any way, for if it is, the settlement will not perform its role properly.

People tend to live in communities of common economic, social, cultural, religious, political and other interests. In human settlements this fact is also expressed in a physical way, by the Shells of the settlement. For example, one basic characteristic connecting all the elements of a community (a shopping centre serving the whole community), should be enough to discourage the splitting of the community into two parts by a canal, if there are no bridges, or by a highway or railway, if there are to be no proper connections above or below it, etc. Should such a split occur, the uniformity and the continuity of the community's texture will cease to exist, in this respect the community will stop functioning as a whole, and the settlement will be deprived of its most basic characteristic – the existence of properly functioning Ekistic units.

In order to function properly, a settlement must have specific social dimensions which are expressed in the form of communities. These may be on a minor or major scale, but on every level they must be complete in order to function properly. Any part of a human settlement should consist of an appropriate number of communities. If we expect an independent

community
class VI

community class V
supersector
supermarket

community class IV
sector, secondary
school, religious
buildings,
shopping centre

community class III
sector, elementary
school, playgrounds,
shops

community class II
larger neighbourhood
gardens, shopping corner

community class I
playgrounds, neigh hood
meeting place
houses-residence

the continuous lines represent the hierarchical structure, the dotted ones represent the possibility of other connections also
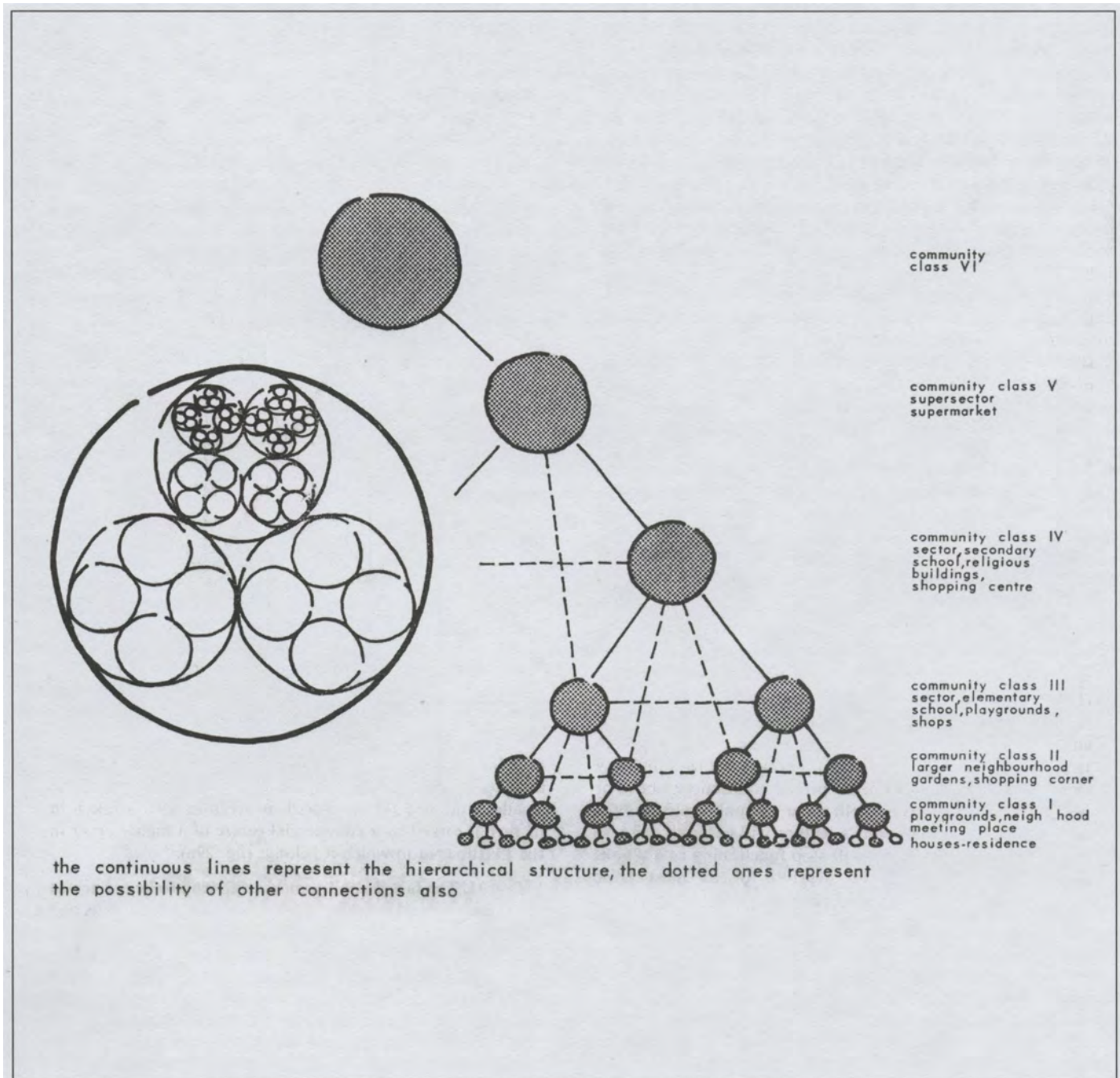
Fig. 23: Hierarchical structure of settlements.

Ekistic unit to function properly, it should be a community of such size as to guarantee its survival.

Law 34. All communities, and therefore, all Ekistic units tend to be connected to each other in a hierarchical manner. Every community of a higher order serves a certain number of communities of a lower order, and the same is true of specific functions within Ekistic units.

A small city may well be the centre of an area of five or six smaller cities and 30 to 50 rural settlements. And it may also be one of the five to eight cities of a similar size which are served by a city of an even higher order. The same holds true for all specific functions within the city. If a city is a commercial centre, it serves the commercial centres of the smaller cities and the rural settlements in its area, while it in its turn is served by a commercial centre of a higher order in the Ekistic area to which it belongs (fig. 23).

Law 35. The fact that all communities tend to be connected in a hierarchical manner does not mean that this connection is an exclusive one. Many other connections at the same level or at different ones are equally possible, but for organisational purposes the connections are hierarchical.

The settlements do not create one-way connections between communities, on the contrary they tend to create many types of connections in all directions; therefore, the possibilities of multiple and not only hierarchical connections are open. It is natural, however, that any organised activity should follow a pattern of hierarchical connections; a merchant with a shop in a community class III, for example, does not buy from the wholesale merchant of class IX, but from the distributor of class V or VI. The administration of municipal services follows the same pattern. This pattern is also followed by any citizen connected with any function, unless he is dissatisfied with the services close to him or unless a service of a higher order is closer to him than one of a lower order. If he wants to buy bread he normally goes to centres class III or IV, but if a supermarket class V happens to be closer to him he might satisfy a need of a lower order in a centre of a higher one.

Law 36. The existence or creation of communities and functions of a higher order does not necessarily mean the elimination of those of a lower one.

The need for a large shopping centre does not mean the elimination of all corner-shops. The same holds true for an urban supermarket and a 'regional supermarket'. Every commercial centre has a function of a different class, magnitude and structure. The corner-shop serves needs which cannot be served by a supermarket situated at a great distance from homes. This law has been overlooked by many people. The fact that we need corner-shops and small units has led them to believe that supermarkets are inhuman. They are as mistaken as those people, who, when the supermarkets first appeared, thought that we should eliminate all services of a lower order because we no longer needed functions or communities or Ekistic units of this type. Practice has shown that both points of view are equally wrong, since there is a hierarchy of functions and communities, and the hierarchical system must function as a whole if the settlement is to function satisfactorily.

This law mentions the existence and creation of communities of a higher order. While it is clear how widely valid this is in existing communities, it is not always true in practice, since the creation of communities of different orders often leads to the elimination of communities of a lower order; especially if their existence depends on the same authority which decided on the creation of a community of a higher order. Sometimes

attempts have been made by the local people to ameliorate the situation by creating, sometimes in spite of the decision of the planning authority, the missing communities of a lower order. This has happened with several new schemes where only a supermarket has been planned and no other shopping facilities have been allowed at lower levels. In such cases people have often remodelled houses in order to provide the missing minor shopping centres, or even created temporary markets on street corners.

Law 37. The type of services and the satisfaction provided by every Ekistic unit, community and function of a higher order to those of a lower order depend on time-distance and cost-distance.

The fact that a hierarchical structure of Ekistic units, communities and functions is needed does not mean that the services provided are the same on every level, for the type of services depends on the level of the Ekistic units and communities. The type of services alone is not enough to measure the satisfaction afforded to the inhabitants. In order to measure the satisfaction one must measure the time-distance and cost-distance, which play an equally important role. An Ekistic unit and a community may well provide services of a higher order, services desired by the inhabitants of Ekistic units and communities of a lower order; let us say that it provides a theatre where the lower units have only a cinema. If, however, this theatre is located at a distance of 100 km from the lower communities, they will visit it infrequently. The satisfaction being offered is weakened by the time-distance especially, and eventually much more so by the cost-distance if there is no public transportation.

Law 38. The overall physical texture of a human settlement depends on its basic Ekistic unit, that is, its Ekistic modulus.

The Ekistic modulus can be as small as a house, or the size of a block, or even the sector of a major community unit between highways, etc. This modulus depends on the size of the Ekistic units and defines its scale. If the Ekistic unit is a house and the modulus the room, and if the rooms are large, the scale of the house is large. If the Ekistic unit is a small city, its modulus is the city block; and if the block is large the scale of the city's texture is large. As a city grows to a large size the original size of its blocks (i.e. its street networks) becomes too small a modulus: they become out of scale. Then there is a necessity for a larger modulus which can be made of groups of blocks – or super-blocks separating pedestrian and vehicular traffic – such as the half mile square blocks in some city plans; or the community unit itself may become much more cohesive, as in the case of the sectors of the metropolitan area of the city of Islamabad.

Law 39. The texture of a human settlement changes as its dimensions change.

For a small city the house or even the housing group or city block may be a good modulus for the entire texture; but for a major city it is too small a unit. The texture of larger human settlements should change when the population of a settlement grows from say 100,000 to one million, since the settlement is unable to operate efficiently with a texture of small blocks. During this expansion major arteries must have made their appearance, either as railways or highways. The texture of the human settlement has probably been re-shaped during its growth. If this has not occurred, it is because of the settlement's inertia; while its inability to change its built-up structure results in its texture being no longer appropriate. The settlement has failed to adjust to the new requirements and consequently it is suffering.

1. London, England (1962): Dynamegalopolis – Average density of built-up area 120 inh/ha (48 inh/acre).

2. Tokyo, Japan (1962): Urban settlements central area – 10-20 million group.

3. Paris, France (1956): Urban settlements central area – 5-10 million group.

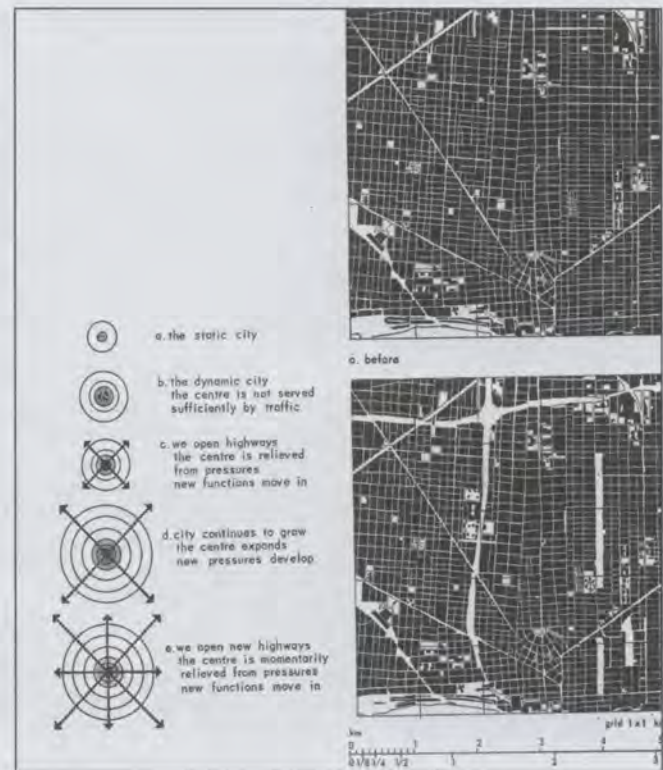4. Downtown Detroit, USA (1961): (below) Death of a settlement's centre by surgery; (right) Urban renewal by surgery.

Fig. 24: Comparison of major urban settlements.

In this respect we can compare Tokyo and London where the old texture of the city has been preserved, to Paris where the texture was changed in the time of Baron Haussmann, and to an American city, like Detroit, where the texture was again changed with the opening of freeways (fig. 24).

Form

Law 40. The main force which shapes human settlements physically is the tendency towards a close interrelationship of all its parts.

Since all parts endeavour to congregate as close as possible, they tend to form a circle with a centre which exercises a centripetal force. As new parts are added, they come to the centre in order to be as close as possible to all others. When new parts can no longer be added in the centre they come as close to it as possible. It is only when they cannot be effectively incorporated in the centre of the built-up area, that they are arranged on the periphery.

Because of this law and because of the centripetal force, small settlements have a very cohesive shape, always tending towards a circle. Without such a force, their parts would be unconnected and would practically 'float' at will. On the basis of this principle, houses not connected with production or any function connected with Nature also tend to be as close to each other as possible. The degree to which this is possible is defined by the space needed around them (fig. 25).

Since within a settlement the parts are not of equal dimensions and importance, they tend to arrange themselves so that those more closely connected are brought even closer, while those less immediately connected to each other move even farther apart. In a village, the peasants' houses are close to its centre. Since these occupy a small space, they can be densely built; they contain the families of people who have many reasons to be close together in order to use common facilities, etc. Dry-farming areas on the other hand, which only certain members of the family occupy for a certain number of hours a day, need not be as close to each other and are usually arranged in the periphery of the settlement. Such a structure is physically expressed as a settlement consisting of two parts: the nucleus or built-up part with a network of streets quite close to each other allowing for small plots and small houses, with the remaining part of the settlement containing the farms served by streets at a much larger distance apart corresponding to the considerably larger size of the farms in relation to the building plots within the built-up nucleus. Theoretically, were this force the only one shaping the settlement, we should be led to the formation of nuclei or built-up parts consisting of one central square and radial streets leading towards it (fig. 25).

The centripetal force does not seem to work in very small settlements. When there are only a few houses – say, ten or 20 – a centripetal force is not always in operation. It seems that because the distances are too small and because it does not matter whether people walk two minutes instead of one, their need to congregate in one centre does not work in the same way. There can also be another explanation for this phenomenon. Such very small settlements have no focal point and are not big enough to have developed a central square or central functions; therefore, in the absence of a centre there is no centripetal force. The fact is that centripetal forces only appear to begin operating in settlements with a few score houses. A parallel could be drawn with the capillary forces in very narrow tubes, where, instead of having the surface of a liquid at a horizontal level, we see it taking a convex or a concave form. As in many natural phenomena, general principles are no longer valid on a micro-scale, the same stands true for settlements.
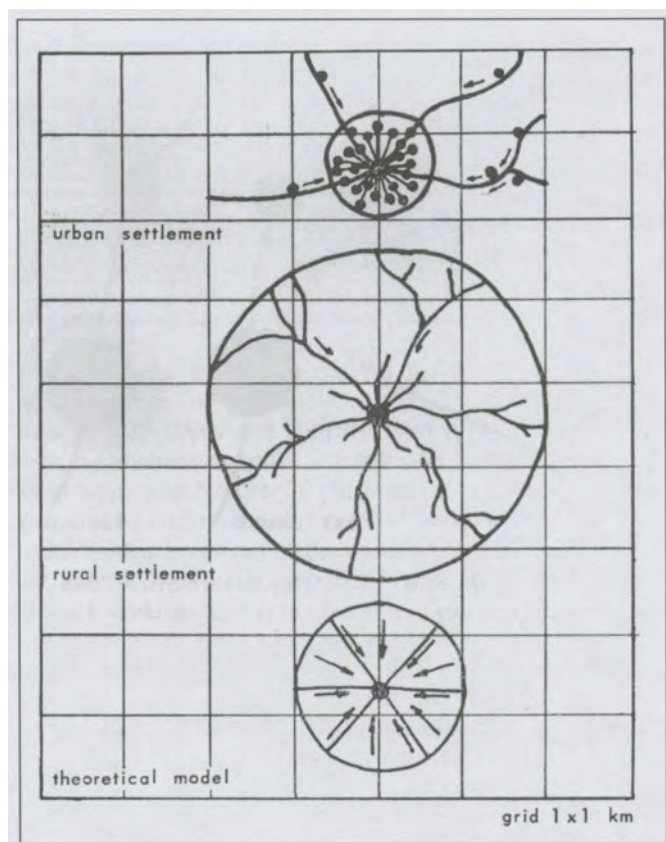

Fig. 25: Centripetal forces.

Law 41. A centripetal force leads to forms of settlements conditioned by curves of equal effort, which ideally appear as concentric circles.

This effort may be expressed physically as the effort required to walk a long distance across a plain versus the effort required to climb a hill, or in the time required to cover these distances, or in the money needed when one must pay in order to move within the settlement. Whether the prevailing curves are of effort, time or money, depends on the values of these elements in every specific case. If, for example, the settlement is small and people do not own mechanical means of transportation, the only important characteristic is human effort, which is the deciding factor. In such a case a settlement on a hillside will tend to have its larger dimensions along the contour lines rather than at right angles, since moving horizontally is easier than going up or downhill (fig. 26).

If the settlement is large and the inhabitants are wealthy enough to own cars, the prevailing characteristic will be time. Thus, a settlement which has a network of streets allowing for the same speed throughout tends to be circular. If, however, one highway crosses the settlement, and the speed on it is twice as much as that within the normal road network, the settlement will tend to take a form corresponding to a combination of the time required for movement both within the normal network and on the highway (fig. 26).

If the settlement is such that some people move on foot, some by private car and others by mass transportation, the money factor tends to prevail and the settlement will usually take a form corresponding to the amount the inhabitants can spend on transportation. This may lead to much more complicated forms, since the movement of one part of the population may be determined on the basis of the human effort required, another on the time required and a third on the basis of money needed. But if, in addition to means of transportation by road,
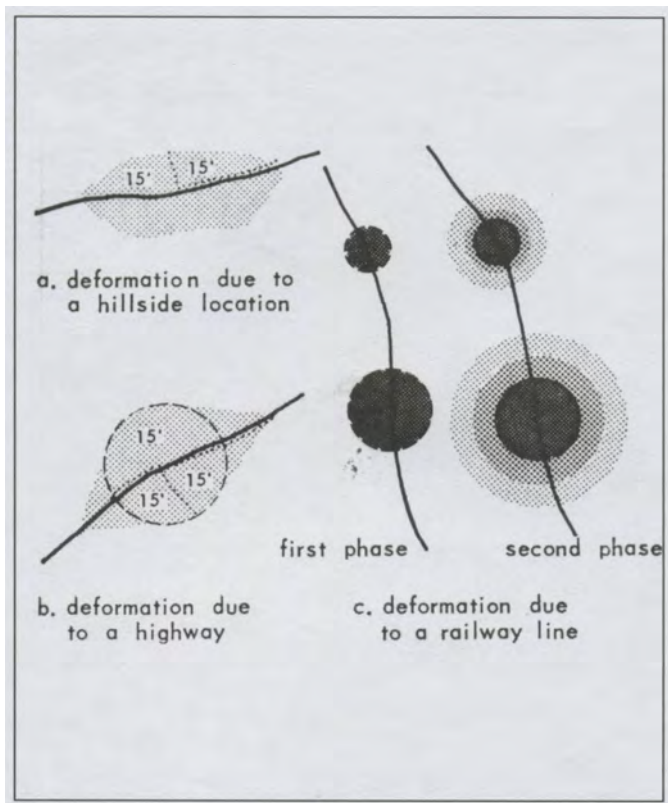
Fig. 26: Equal effort principle.

a. deformation due to a hillside location

b. deformation due to a highway

c. deformation due to a railway line

first phase   second phase

the city has a railway passing through it which stops only at certain distant points easily accessible by train, the fares may be quite expensive for everybody, so that the train will be used only by a certain number of inhabitants. This may lead to a still more complicated form of a series of built-up parts around the station, which can later merge into one (fig. 26).

Law 42. Linear forces lead to the formation of linear parts of settlements; under certain conditions, this may lead to a linear form of the entire settlement for a certain length only, and after a certain period of time.

If instead of having railways (which create settlements around their stations) we have highways (which facilitate traffic along them while access to them is not completely limited as with railways), then the settlement tends to become linear (fig. 27). If the highway has limited access, then we may have a tendency for the creation of a linear settlement on the one side. The width and distribution of land uses along the highway always tend to be the same.
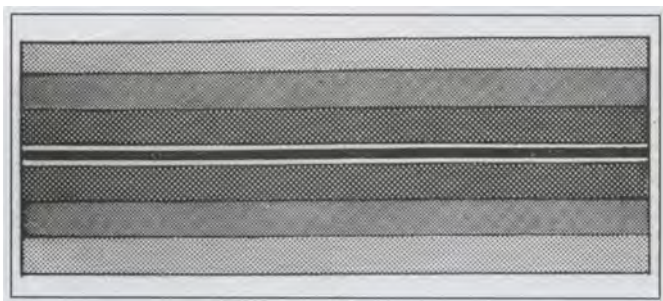

Fig. 27: Theoretical pattern of linear settlements.

Law 43. Undetermined forces, usually caused by the form of the landscape, lead to the formation of settlements of an undetermined form.

These settlements may take shape on the banks of a river or by a lake or by the seashore with a beautiful view or even by a narrow valley. They may resemble linear ones or they may well be of a completely undetermined form. Their width and distribution of land uses may also not be the same.

Law 44. The form of a settlement is determined by a combination of the central, linear and undetermined forces in adjustment to the landscape and in accordance with its positive and negative characteristics.

An elongated valley will by necessity have an elongated settlement, for its development along the main axis of the valley is easier than at a right angle (fig. 28). A landscape which is divided by rivers will lead the settlement to a form adjusted to the shapes of the land left intact. It is not easy to cross a river many times or to build a settlement on a delta. Thus, a settlement which grows in a valley near a river is built mainly where the river is most easy to cross. Its later expansion will follow forms that avoid the necessity of building on the swamps of a delta or of making many river crossings.

There are also positive aspects of the impact of the landscape on the form of the settlement. If, for example, a settlement is built near a bay, it is quite natural for parts of it to be influenced by the positive aspects of a coastal area which attracts both residents and industry. This may occur even if there is no economic motive for the sake of better contact between Man and Nature. If the inhabitants are fishermen they want to be as close as possible to the beach where they can pull their fishing boats out of the water whenever the weather is bad. In this case, the element of Nature acts not only as an element of production, but also as a line of transportation. But even when this factor does not exist, in order to take full advantage of the beauty provided by the sea, or the sea breeze, the settlement will become adjusted to the form of the landscape; this may well result in a crescent-shaped form. In such a case, the focal point of the settlement, the centre itself will also be elongated.

Law 45. A settlement grows in the areas of the greatest attraction and least resistance.

Laws 43 and 44 lead to the conclusion that settlements and their overall functions develop along their main lines of transportation, conditioned by other elements, such as Nature, the type of Society, special functions, the types of transportation used, the cost of movement, etc. These laws also lead to the statement that the growth of settlements takes place on the basis of the curves of equal effort, equal time, equal money, etc., or a combination of these, as adjusted to the actual landscape. In addition to them, Law 45 clarifies that not only attraction but also the least resistance influences the growth of settlements.

Law 46. A factor with a direct impact on the form of a settlement is the need for security which may at times be even more important than the main centripetal force.

The form conditioned by the need for security depends on the kind of potential danger. In the past, the need for security influenced settlements in the same way as centripetal forces did. The danger coming from outside exercised pressures on the settlement leading it to a circular form which offered the minimum length of walls to be defended with the maximum enclosed surface (fig. 29a).

Then, airplanes threatened the settlement and therefore the opposite form was necessary for defence against an air at-
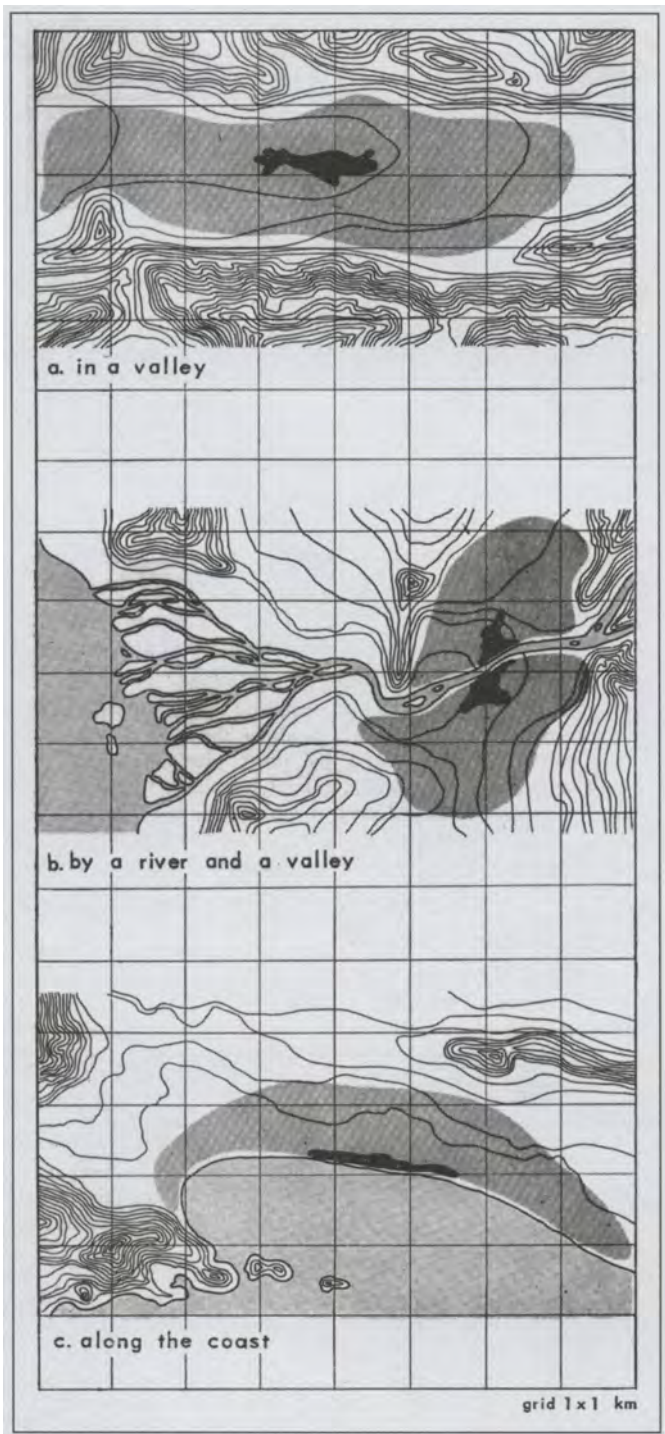
Fig. 28: Forms of settlements determined by the landscape.

Fig. 29: Forms of settlements determined by the need for security.

tack. It was no longer necessary to present the minimum length of periphery line for defence; on the contrary it became necessary to be spread away from the centre, which might be hit, in order to present the enemy with a maximum surface. In this case, security comes into conflict with the settlement's natural centripetal forces (fig. 29b).

The fear of an attack by an even larger force from the air – nuclear weapons – may force settlements to be even farther apart, since the vulnerable area will be much larger and entire major settlements could be eliminated during an attack. Security, therefore, develops centrifugal forces which may
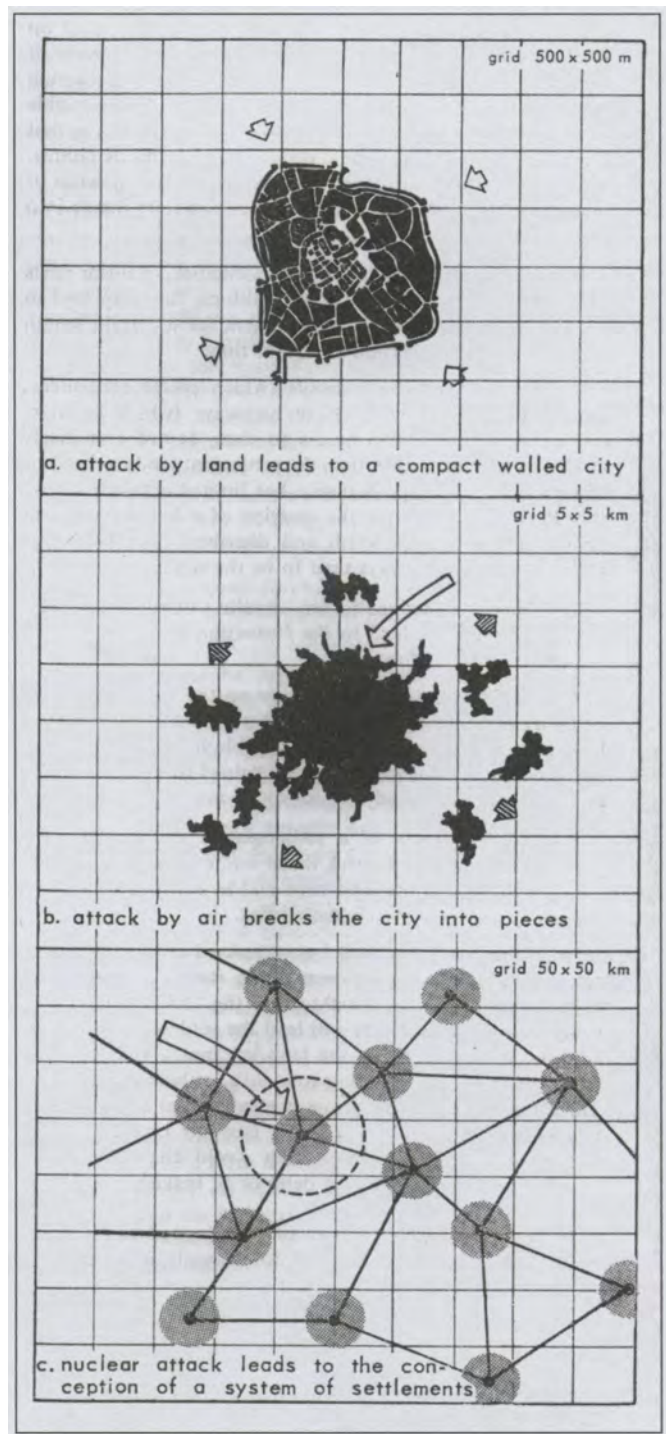
spread the settlement over larger areas, with a number of very small parts and many others which may become linear. Thus, from the point of view of security, modern weapons are leading us towards new types of settlements which look much more like systems of nodal points and transportation lines than the compact built-up areas that prevailed in the past. A system which depends on many nodal points and circulatory lines becomes more important than the one-nucleus compact settlement since only such a system can survive, even if its central nucleus is completely destroyed (fig. 29c).

Law 47. Another force which exercises an influence on the form of a settlement is the tendency towards an orderly pattern.

For example, if the settlement is small (fig. 30a), the centripetal forces may themselves define the final shape. But should the settlement grow large enough, it will become apparent that the centripetal forces lead to an unmanageable form (fig. 30b) because the blocks will be very small in the centre and very large in the outlying area or if we want equal blocks, the street pattern will not make sense. In any case the form of the plots does not help the construction of rectilinear buildings. If we respect only the principle of order as derived from the desire of people to build their houses in rectangular space, which requires rectangular plots, this will lead to a grid-iron system for the road network (fig. 30c).

So, we are led to the conclusion that a settlement should be formed like a wheel on the basis of the centripetal principle, and like a grid-iron on the basis of the desire and tendency for absolute order. These two patterns contradict each other. We cannot combine a centripetal with a grid-iron pattern. Neither the desire for maximum cohesion nor for maximum order has any meaning or leads anywhere if deprived of the comprehensive view of how best to serve the total problem of the settlement. Only those forms of settlements make sense which can on every specific occasion merge reasonably the basic principles of settlements for cohesion and an orderly pattern. How this is done depends on each specific case and is the subject matter of a chapter on the morphology of settlements.

Law 48. The final form of the settlement depends on the total sum of the forces already mentioned as well as others such as tradition and cultural factors, which play a greater role in the lower units. The final form is a result of the interplay of these primary, secondary and tertiary forces.

How these forces interact, which one is stronger and which weaker, is not an easy question to answer, since their interplay changes on the basis of many variables. Location, as we have seen, differs in importance according to the size of the settlement. The basic structure of a settlement depends not only on its size, but also on its type of traffic. Traffic not only depends on the number of people, or on economic activity, but also on the means of transportation. It is reasonable to try to acquire gradually a better understanding of the interplay between some of these forces which will lead us to the formulation of rules. In this sense, it is useful even at this point to explore some of the related laws.

Law 49. The form of the settlement is satisfactory only if all the forces of varying importance within it can be brought into balance physically.

We have already seen that all the elements of a settlement tend to be in balance (Law 21). This must also be expressed in a physical way, otherwise the form of the settlement will be unsatisfactory. The elements and the forces are diverse and play a different role in the varied types of Ekistic units and at the various levels of the Ekistic scale.

There are forces which influence only the smallest Ekistic scales. For example, the preference of one individual or one family for a certain type of house is a force of only local importance. The architecture of this house is a combination of the force of the smallest Ekistic unit – that is, the preference of the inhabitant – with the forces of the community in which he lives, the forces of a major Ekistic unit. Man alone cannot decide on the architecture of his house; he must respect the regulations, and in a certain way also the common desire of the community for a house acceptable to most of its members. For example, even if there are no regulations prohibit-
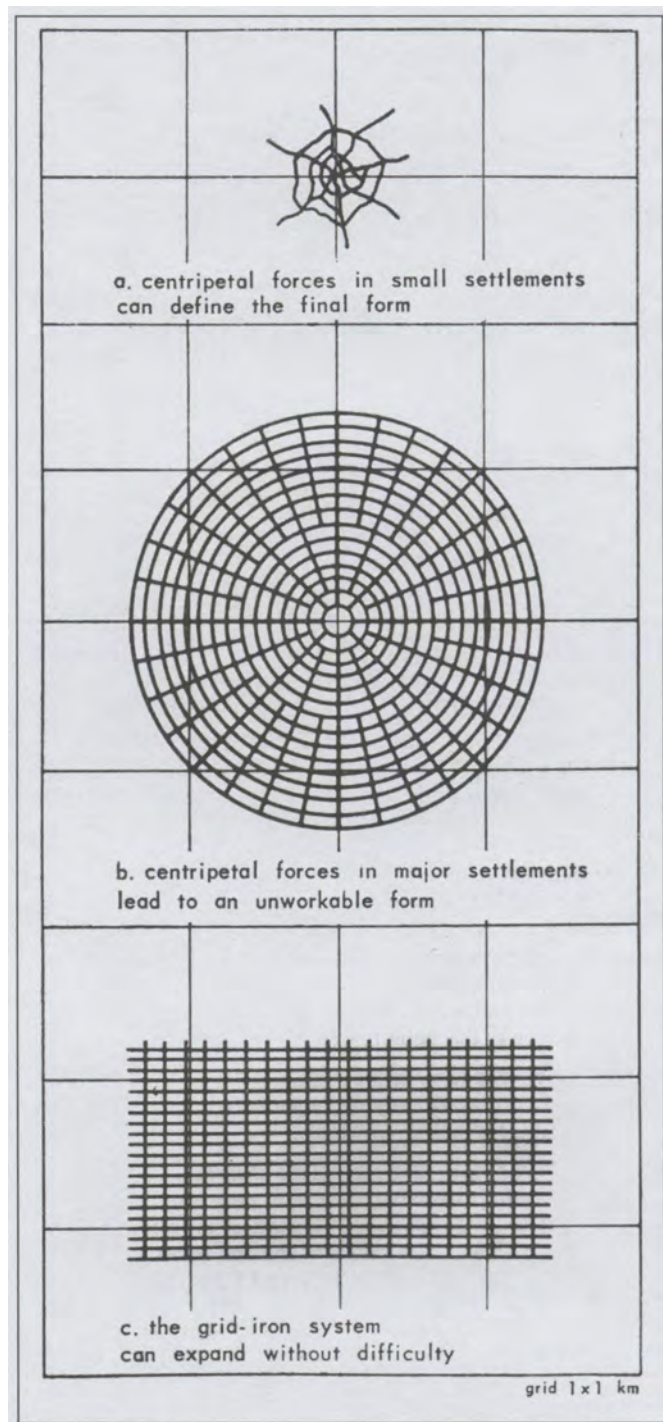

a. centripetal forces in small settlements can define the final form

b. centripetal forces in major settlements lead to an unworkable form

c. the grid-iron system can expand without difficulty

grid 1 x 1 km

Fig. 30: Tendency to achieve an orderly pattern.

ing it, it is difficult to accept a house painted black. The community would most probably protest and force the owner to change the colour to a more acceptable one.

All forces are broken up and act at different levels. For example, the house is much more influenced by the forces of the immediate neighbourhood than by those of the major community or the major city. In accordance with this rule, however, we will find that there are forces influencing this house which are derived from the city, the region, the nation, and finally even the whole world. Forces such as industrialisation, building materials, the behaviour of concrete and the
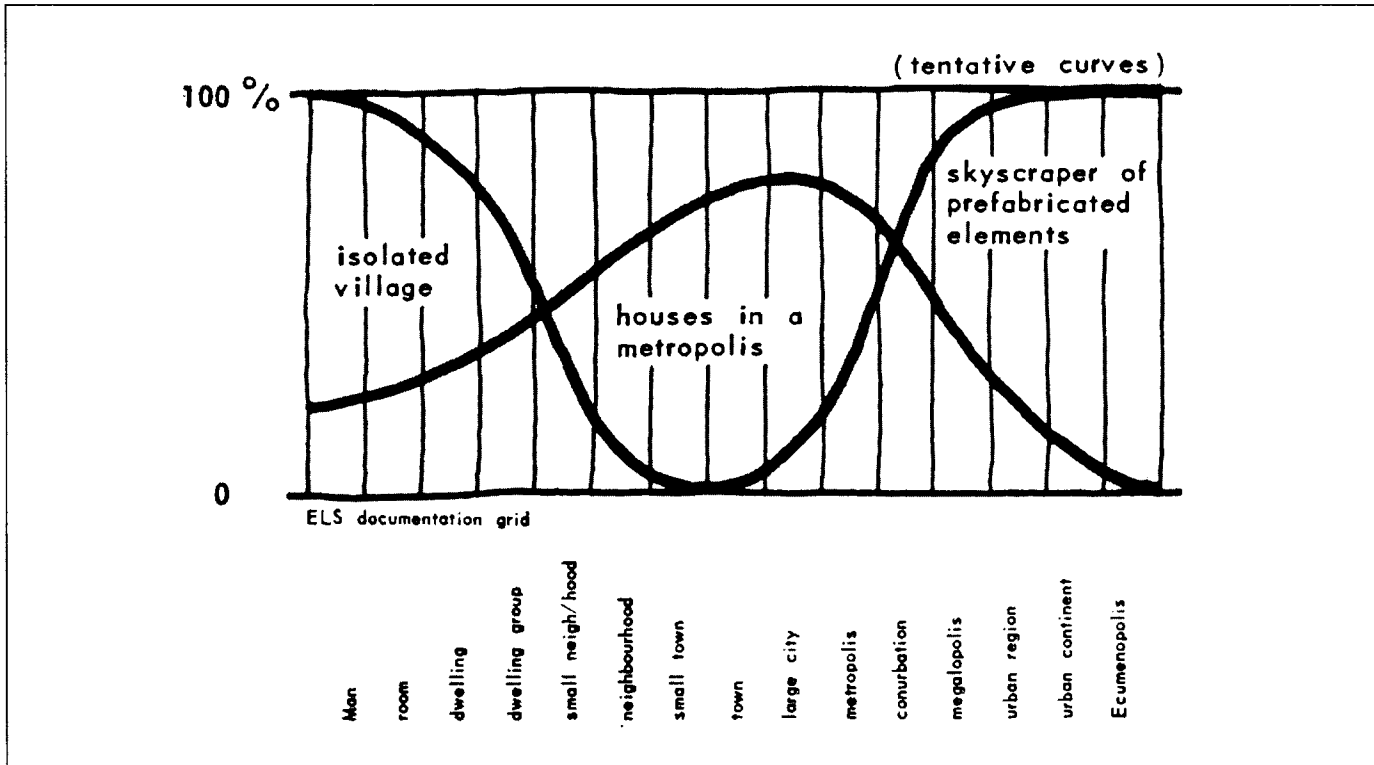
Fig. 31: Forces influencing the form of Ekistic units.

rules conditioning it, are of international importance; whereas decorations, which may be created even with the same concrete, are very local in content.

Thus, the sum total of the forces influencing a settlement on every level is equal to that of the forces derived from Ekistic units on all levels (fig. 31). The curve showing this may vary in steepness due to forces derived from the smaller units or from forces derived from the higher unit.

Law 50. The right form for a human settlement is that which best expresses all the static positions and dynamic movements of Man, animals and machines within its space.

Man sits, stands, walks and runs in a city; so do animals serving his purposes, as well as machines. The form of the city should respect and express all these positions and movements within the settlement, for otherwise the form will not correspond to the main content of the city, that is, Man as well as the animals and machines. In the same way in which Marshall McLuhan states that 'only phonetic writing has the power to translate man from the tribal to the civilized sphere, to give him an eye for an ear',[2] only the proper expression of all needs can satisfy us aesthetically. I will mention one example: a central square serves the functions of people who stand, walk and circulate in it. It is stable and static and the people in it move slowly. So, the perspective of the roads leading to it should not be open, since this will transmit the image of through movement, which is contrary to the function of stability in the square (fig. 32a). The perspective leading to such a square should be closed, only then will it truly express the real needs of the square and those who use it (fig. 32b).

Law 51. The right form is that which expresses the importance, class and, consequently, the relative scale of every Ekistic unit with the proper basic moduli and their subdivision.
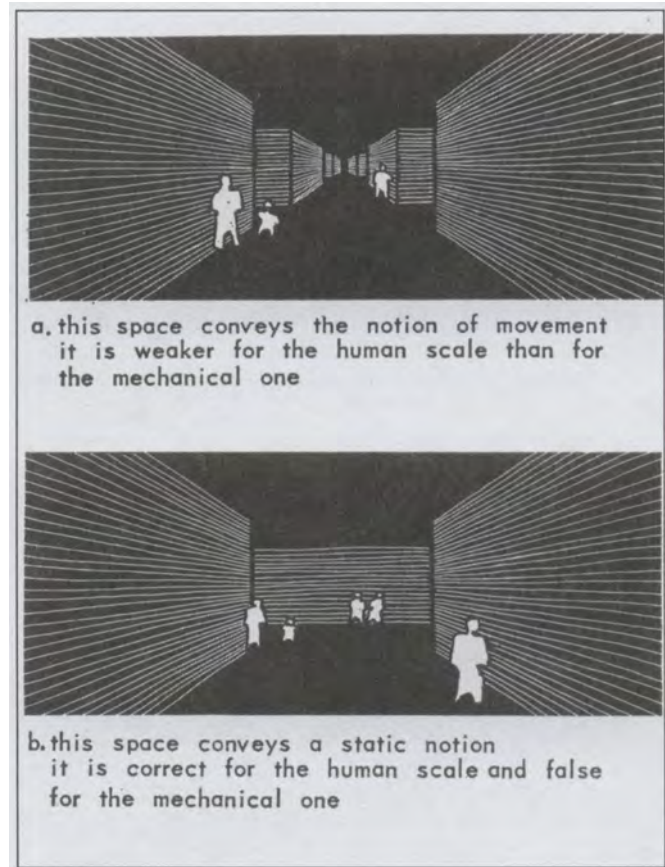

a. this space conveys the notion of movement it is weaker for the human scale than for the mechanical one

b. this space conveys a static notion it is correct for the human scale and false for the mechanical one

Fig. 32: Conception of space in relation to the human and mechanical scales.

In a small city, let us say ancient Greek Miletus, the traditional city-block is its proper modulus (fig. 33a). The same is valid for most other small cities or villages. When the city is larger, a normal city-block, as the only modulus of its texture (fig. 33b), leads to an overall form which is deprived of scale and character. Such an overall form needs divisions of a higher order; the block may remain as one of their sub-divisions (fig. 33c).

Law 52. The densities in a settlement or in any of its parts depend on the forces which are exercised upon it.

Traffic density depends on the forces which bring traffic into a certain area. Population density during office hours depends on the forces which create a need for office functions in this particular area. The same is true of residential or of any other type of density.

Law 53. In human settlements formed by a normal process the pattern of densities changes in a rational and continuous way according to the level of the Ekistic unit and the functions served.

Such a principle means that there are no unreasonable transfers from very low to very high densities. There is a rational pattern for changing densities following the pattern of the hierarchical community structure. This principle is valid when the development of the settlement has taken place slowly over the years, either without conscious planning by Society, which imposes regulations, or with an intervention which respects the natural structure of the entire settlement.

According to this principle it is impossible in any Ekistic space which has been developed normally, especially at a normal speed, to have an area with a density of habitation, functions, investment and settlement not adjusted to the whole. If in the texture of the settlement there is any waste space, it will tend to be taken over by functions which will fill this area at the required density of people, functions and investment. If this does not happen, it will usually be due to man-made conditions of legal, administrative or economic significance. Human settlements cannot bear vacuums or a weakening of their texture in any section. If a vacuum remains, the settlement tends to fill it with functions, the densities of which are conditioned by those of the surrounding area.

Law 54. The satisfaction derived from the services provided by the Ekistic unit to the inhabitants greatly depends on the proper density of the settlement.

A settlement may have a great number of inhabitants, but the services provided to them may be on a very low scale, should the density of their habitation be very low, and the distances between people and between the people and central functions be large. On the other hand, an area with a smaller number of inhabitants who have settled in the right density is able to provide them with more satisfactory services.

The principles of the relationship of satisfaction derived from services to densities is derived from Law 37, since time- and cost-distances increase with lower densities, the services provided at lower densities decrease in importance. Densities can be expressed in different ways, such as in the physical proximity of the people who have settled, the physical proximity of the functions and the elements of the Shells, the degree of investment which has taken place over the whole area, etc. All these types of densities are of a similar nature, and they tend to increase or decrease simultaneously, although these changes are effected by different coefficients.
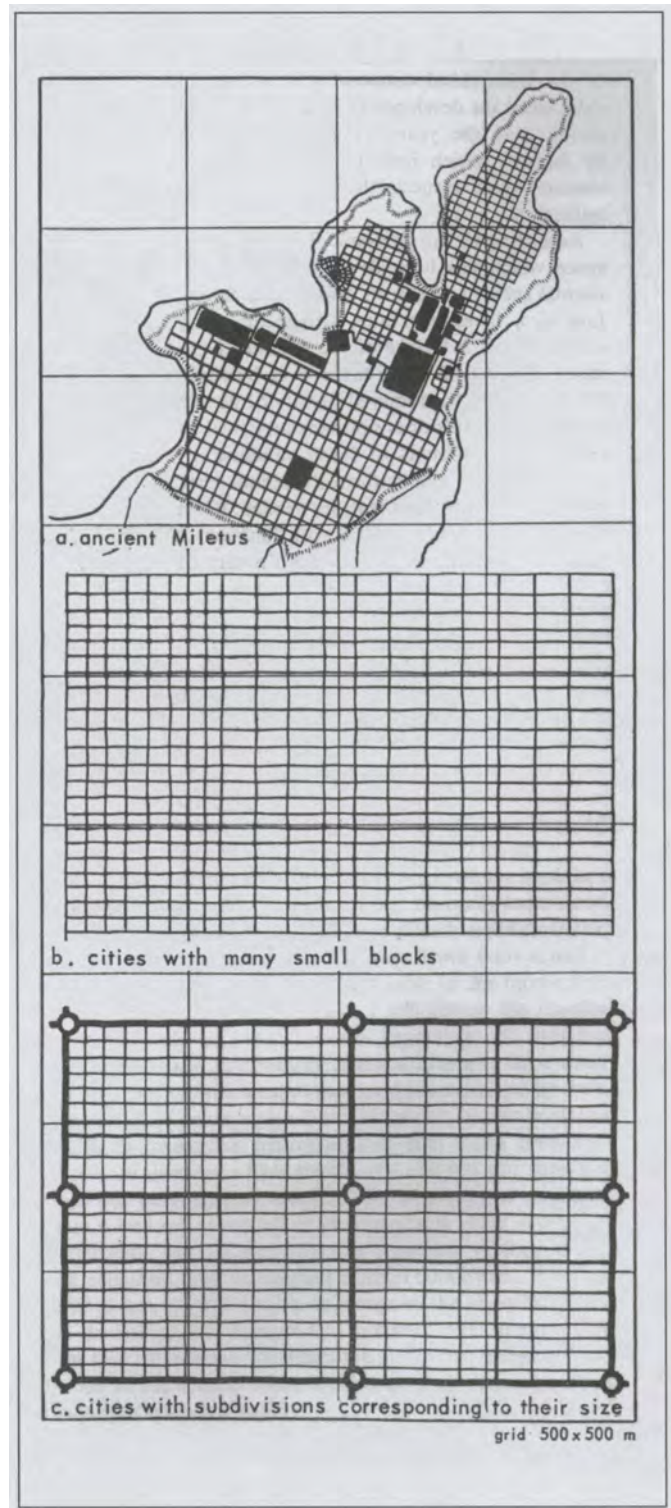

a. ancient Miletus

b. cities with many small blocks

c. cities with subdivisions corresponding to their size
grid 500 x 500 m

Fig. 33: The proper structure of a settlement has to express its scale by the proper modulus.

Notes

1. Leonard J. Duhl (ed.), *The Urban Condition*, page 69.
2. Marshall McLuhan, *The Gutenberg Galaxy, the Making of Typographic Man*, page 27.

66

Ekistic units

When I started my career as an architect and, with. my concern about human settlements, I found that there was always a confusion about the subject matter of our field, its contents and its dimensions. People spoke about a city, irrespective of whether it was an urban settlement of 5,000 people or a metropolis of several hundreds of thousands, and about "city design" even when dealing with a megalopolis of millions. Also they often spoke of buildings when they meant a settlement or a community facility. This is the reason why I have tried to put some order into our subject matter and to classify it in a uniform way which, if universally accepted, could help us to understand each other, to clarify the issues, to lead to their understanding and thus toward the solution of the problems of human settlements.

I have tried several methods. With some I failed, with some I have succeeded in different degrees. They have led me to the conclusion that what we need is a system of two-dimensional ekistic grids which can help us to classify all our ekistic knowledge in a unified way. One dimension, the horizontal one, should be the ekistic logarithmic scale from man to the whole earth (or Ecumenopolis, the universal city) with the size of the human settlement as its basic characteristic. The second dimension should cover either the elements of human settlements (Nature, Man, Society, Networks, Shells), or the disciplines dealing with them (economics, social sciences, political administrative sciences, technology and art); or other aspects which are of special interest to us.

It is natural for ekistics, being the science of human settlements, to be divided in terms of human settlements. It is therefore reasonable to accept the division by settlements as the most basic division of our subject matter. In order to facilitate such a division, we can use a logarithmic scale of typical population or of area sizes to encompass the following 15 ekistic units: Man, Room, Dwelling, Dwelling Group, Small Neighborhood, Neighborhood, Small Town, Town, Large City, Metropolis, Conurbation, Megalopolis, Urbanized Region, Urbanized Continent, Ecumenopolis (figs. 1 and 2).

On the basis of such a scale we can first speak of the ekistics of a microscale. This comprises the room and the dwel-

Ekistic unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Com. class				I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Kinetic field	a	b	c	d	e	f	g	A	B	C	D	E	F	G	H
name of unit	Man	room	dwelling	dwelling group	small neighborhood	neighborhood	small town	town	large city	metropolis	conurbation	metropolis	urban region	urbanized continent	Ecumenopolis
population	1	2	4	40	250	1,500	9,000	50,000	300,000	2 M	14 M	100 M	700 M	5,000 M	30,000 M

Fig. 1: Ekistic logarithmic scales and grid: old nomenclature.

Ekistic unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Com. class				I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Kinetic field	a	b	c	d	e	f	g	A	B	C	D	E	F	G	H
name of unit	Anthropos	room	house	housegroup	small neighborhood	neighborhood	small polis	polis	small metropolis	metropolis	small megalopolis	megalopolis	small eperopolis	eperopolis	Ecumenopolis
population	1	2	4	40	250	1,500	9,000	50,000	300,000	2 M	14 M	100 M	700 M	5,000 M	30,000 M

Fig. 2: Ekistic logarithmic scales and grid: new nomenclature.

ling up to the neighborhood. In many respects, it coincides with architectural space. Ekistics of the middle scale is the next category, comprising the small town, the town, the large city and the metropolis. This in many respects coincides with city planning or urbanism. Finally, we have ekistics of the macroscale which starts with regional planning and ends with continental or terrestrial planning.

From the very beginning of our: efforts to establish a systematic approach to human settlements, an attempt has been made to create an ekistic scale which could include *all* types of human settlements ancient, present and future, and from the smallest to the largest possible ones. The basis for such a classification was the population size of each as people are the most important element of human settlements.

Very early we concluded that we have to deal with fifteen units, from the single individual Anthropos, to the several billions of Ecumenopolis (fig. 3).

This general scale has recently been slightly altered on the basis of a long experience of its use. These alterations do not change anything in substance and the number of ekistic units remain 15 as before.

The first change was necessary to develop a better glossary and a more rational language. This glossary has to be different when referring to rural or urban human settlements but I am using it here for the urban settlements. It starts with Anthropos, instead of Man (which is oriented towards one sex), and continues with room, house and housegroup. From then on it uses one term for the following five pairs of units, the first being called a small version of the second, and it ends with Ecumenopolis (fig. 4). This makes the glossary simpler, by confining it to well-understood terms, like room, and by using the term "polis" in a sequence of different ways. Some are old (metropolis, megalopolis) but have been successfully used in the present day. Others are based on successful experience (eperopolis or the continental city and Ecumenopolis or the global city).

The second change concerns the figures of population related to each unit. Recently, I have made a systematic effort to use two ekistic scales in conjunction: the ekistic population scale (EPS) and the ekistic territorial scale (ETS). This effort

has shown that we need a more accurate scale to make proper comparisons between people and their territory.

The smallest unit is Anthropos himself as an individual. This spatial unit includes the individual, his clothing, and certain furniture, like "his" chair. The second unit can also be well defined. It is the space which belongs to Anthropos alone, or is shared under certain circumstances with a few others – that is, "his" personal room. The third unit, the family home, can also be clearly defined as long as we have families. The fourth unit is a group of homes which corresponds to the patriarchal home of earlier days and, probably, to the unit of the extended family of the present day. This is the unit that is most important to children. Their mothers need it mainly because of the children, and their fathers need it mainly because they are interested in the satisfaction and happiness of mothers and children.

I have now defined four units: the first three very clearly defined, physically and socially, and the fourth which can be conceived as a social unit. Beyond this point there can be no such clear-cut definitions of any unit until we reach the largest one possible on this earth – that is, the systems of human settlements of the whole planet. This means there are five basic units, four at one extreme of our scale and one at the other. No other well-defined unit exists today, though there are official statistically defined units, which are quite arbitrary as may be seen from the differences in their official definitions from one country to another. If we look back into history, however, we find that, throughout the long evolution of human settlements, people in all parts of the world have tended to create urban settlements which reached an optimum size of 50,000 people and whose physical dimensions were such that everyone lived within a ten-minute walking distance from the center. There is no question that, for people who depend on walking as a means of locomotion, this is the optimum unit from the point of view of social interaction through direct contacts between people.

We now have four clearly defined units at the beginning of the scale, one larger unit somewhere beyond them, and another unit at the far end: a total of six. How can we complete the scale?

Fig. 3: Ekistic logarithmic scales and grid: new nomenclature.

Fig. 4: Ekistic logarithmic scales and grid: new nomenclature and ekistic population scale.

One way this can be achieved is to consider units of space as measured by their surfaces and to increase their size by multiples of seven. The figure seven is based on a theory, first presented by Walter Christaller, that space can rationally be divided into hexagons, each central hexagon being surrounded by six of equal size. This system also works well for the organization of population, movement, transportation, and so on. Such considerations have led us to the conclusion that all human settlements — past, present, and future — can be classified in this way into 15 units. The basic units are units no. 1 (Anthropos), no. 2 (room), no. 3 (home), no. 4 (group of homes), no. 8 (traditional town), and no. 15 (universal city), and a systematic subdivision then defines the others. These units can also be classified in terms of communities (from I to XII), of kinetic fields (for pedestrians, from a to g; for motor vehicles, from A to H; and so on) (fig. 4).

This EPS must be used whenever careful comparisons are needed, but it has the disadvantage that it cannot easily be remembered. To solve this problem I have reformed it in two ways.

• First, I have used round figures that can be more easily understood and remembered.
• Second, I have also given the whole range of populations that falls within each separate unit (fig. 3).

This gives a possibility to classify every human settlement in its appropriate category, and creates a basis for a statistical classification of all human settlements.

Anthropocosmos model

This article has been assembled from three papers presented to Delos Eleven, with the addition of some explanatory passages from The Human Settlements Research Project *report presented by C.A. Doxiadis to the International Federation of Institutes for Advanced Study (IFIAS) in May 1974.* (Source: Ekistics, *vol. 38, no. 229, December 1974, pp. 405-412).*

can recognize the relative importance of each situation and each problem.

Each human settlement contains so many individuals, organs, cells and elements that there is no hope of progress unless we develop a comprehensive model to include every

The overall concept of Anthropocosmos

The purpose of this study is to help us clarify Anthropocosmos and to understand how we can be more successful in dealing with human settlements. Anthropocosmos is our system of life and the human settlement is our goal. Its purpose must always be to serve Anthropos[1] and not any individual interests that work against the broader human goal.

The basic tasks of this study are to define:

1. the overall concept of *Anthropocosmos,*
2. the notion of *human settlements,*
3. the *language* we should use,
4. the *taxonomic frame,*
5-8. *basic classifications,*
9. a working *model of Anthropocosmos,*
10. the *selection and evaluation of data.*

I set out the *twelve radical changes* we need to lead toward action for human settlements.

The solution of the problem of our confusion about the overall concept of Anthropocosmos is to create a frame model which can help us to understand how to conceive and to build the whole Anthropocosmos properly. We can begin to do this in the following way:

1. Define our total system of life – Anthropocosmos – by creating a systematic frame so that any part of it can be clearly located within it.
2. Define all relationships (causal and noncausal) that may exist between any parts of the system so that we can understand its functions and changes.
3. Define a method for the measurement or evaluation of all parts of the system and their interrelationships (including those that cannot now be scientifically measured), so that we

Legend

1 Ekistic population scale (see Table 2)
2 Ekistic territorial scale (see Table 3)
3 Ekistic time scale (see Fig. 3)
4 Ekistic elements (see below)
5 Aspects (see Fig. 4)
6 Principles (see Fig. 4)

N   Nature
A   Anthropos
S   Society
Sh Shells
Ne Networks
HS Human Settlements
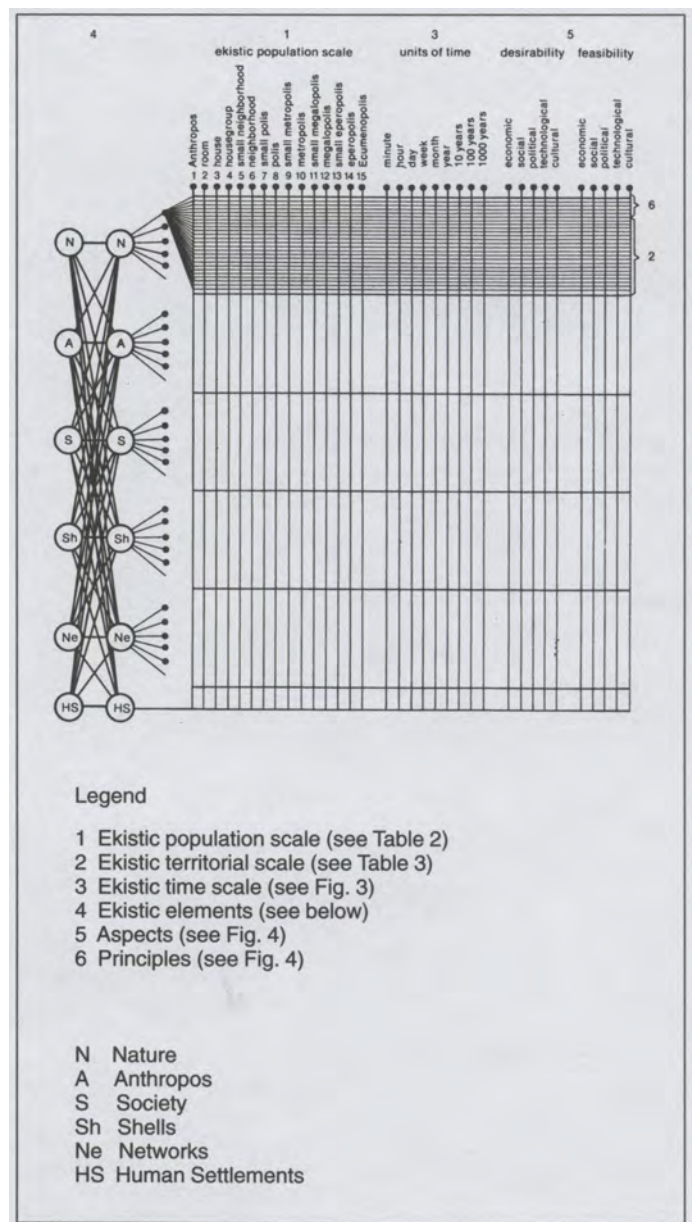
Fig. 1: The Total Anthropocosmos model.

single element, aspect, relationship, and so on, that exists within each settlement. This is the Anthropocosmos model (fig. 1). Into this comprehensive model we can insert the input from all the disciplines concerned. The model can also help to work out a strategy for breaking down mental barriers and connecting disciplines together. Thus we may hope to avoid interdisciplinary anarchy and build up a team which, having grasped the concept that settlements are a total system, can bring all the necessary hard-headed expertise together.

The only way to mobilize the resources provided by many disciplines for the benefit of human settlements is to guide them towards making the interconnections which are needed, and to create a framework which can contain all the contributions they want to make, and can make.

The concept of human settlements

Human settlements are the territorial arrangements made by Anthropos for his own sake. They are the results of human action and their goal is human survival, an easier and better life (especially in early childhood); happiness and safety (as Aristotle demanded);[2] and opportunities for human development.

The term "human settlements" is not yet clearly defined. What exactly *are* human settlements? Are they cities, villages, housing, people, society, buildings or something else? In 1964 I proposed using the term "human settlements" instead of "housing, building and planning" to the United Nations Committee on Housing, Building and Planning.[3] My motion was defeated then, but a few years later "human settlements" was accepted as the correct term, although – even within the United Nations itself – there is no "agreed-upon definition."[4] This is because human settlements are the most complex systems of life on our globe. They are two orders higher than cells and one order higher than "bodies" (if we follow Sir Julian Huxley's classification of individuals).[5] However, human settlements not only have a complexity many times higher than their component bodies (or individuals), but they are additionally confusing because they are much younger and more primitive than bodies, and very much more so than cells.

Human settlements include very temporary settlements (where the ground has simply been leveled enough for a night's sleep), semi-permanent settlements (from nomadic tents to spaceships), and permanent settlements (from very small to enormous ones). Some of these are growing so much that we are beginning to face millions of individual human settlements merging into one universal human settlement, that is Ecumenopolis.

For some 10,000 years human beings experimented with the creation of village-scale human settlements, and then for another 8,000 years or so with towns and cities. These reached a successful maximum size of 50,000 people (ekistic unit 8). Larger human settlements were few; they reached up to some hundreds of thousands (ekistic unit 9) and some even touched a maximum of one million people (ekistic unit 10), but, with a few exceptions (such as Peking), these settlements did not survive. This can be interpreted to mean that humanity has managed to solve the problems of human settlements up to the level of ekistic unit 8.

Nowadays human settlements are increasingly complex for many obvious reasons, including the increase in population and the introduction of new factors such as machines. The overriding reasons for their greater complexity are the many changes in their different dimensions. We now live in metropolises and also in megalopolises (ekistic units 10-12) and even, in some respects, in the global city (ekistic unit 15).

One of the negative comments made on the possibility of a scientific approach to and a science of human settlements is that human settlements are so different from each other that any systematic study of them is not possible. It is a good thing that Carolus Linnaeus was not impressed by such statements because there are much greater differences between the different kinds of plants and animals; yet in spite of this we have both botany and zoology. There is no question that we need to find a systematic and scientific approach to human settlements.

One of the difficulties of developing a classification system for human settlements is that we have to deal with much smaller total numbers than when dealing with animals or plants. Altogether there are no more than a few tens of millions of settlements (if we do not consider house units but only entire settlements, from small hamlets to large cities) whereas there are more than 300,000 species of plants and more than one million species of animals; and new discoveries increase these numbers by 10,000 to 20,000 a year.

The need for a common language

There is a basic need to develop an accepted vocabulary, so that all those people dealing with human settlements can understand one another. One of the main reasons we face such a state of confusion today is that we have no accepted vocabulary.

Moreover a common language is essential to open the road for the necessary comparative studies and attempts at measurement which can lead to a systematic taxonomy and classification.

For example we can regard the total human settlement as consisting of four types of areas: the *Naturareas* (where Anthropos is only a visitor and hunter), *Cultivareas* (where Anthropos is cultivating Nature), *Anthropareas* (where Anthropos lives and uses Nature's territories for all expressions of his life, from houses to work, entertainment, sports, etc.), and *Industrareas* (where Anthropos transforms natural resources as in mining and industry).

Taxonomic framework and classification

The next task is the creation of a logical and taxonomic frame for a systematic understanding and classification of Anthropocosmos and human settlements. Taxonomy is the basis of "the theoretical study of classification, including its bases, principles, procedures and rules"[6] and numerical taxonomy uses taxonomy as the proper term.[7] The following classification system uses both Aristotelian logic, as Linnaeus did, and taxonomy which provides a means "to arrive at judgments of affinity based on multiple and unweighted characters without the time and controversy which seem necessary at present for the maturation of taxonomy judgments."[8]

The first question is how we can proceed to classify human settlements. At present we have only very general categories, such as villages, towns, cities, etc. Among several efforts at more specific classification there is a tendency (especially since photography is the main method of visual presentation of human settlements) to attempt a classification on the basis of their appearance and to speak of a morphogenesis. But a "purely morphological definition must be subordinated to the concept that the species is composed of populations in which variability is inherent."[9] Thus we have to find a way to measure all possible characters.

I propose a taxonomy of human settlements which is similar in structure and terminology to that of animals and plants (table 1). A proper classification requires the consideration of a very great number of characteristics, but I am only using a few here to demonstrate the process that we need to achieve this goal.

Table 1
Taxonomy of human settlements

	Rank	Characters and Views
1.	division	basic dimensions and economic functions
2.	class	Ekistic Population Units
3.	order	central and peripheral
4.	genus	structure and function (compact or dispersed, etc.)
5.	section	structure and function (natural, planned, both natural and planned, static, dynamic, etc.)
6.	series	structure and function (radical, orthogonal, etc.)
7.	species	satisfaction of five principles
8.	variety	satisfaction of five aspects

There are some basic differences between the taxonomy of plants and animals and the taxonomy of human settlements. While it is very clear that the taxa of plants and animals are mainly based on their genetic inheritance, this can be disputed for human settlements. Another difference is that most human settlements which have ever been created are still alive, although they may have undergone positive and negative changes. This means that two small towns, very similar in structure and form, may not be able to be classified in the same taxon if one is losing people and the other is not. In other words, our classification cannot be limited to identifying species but must also include the phases and conditions of life inside human settlements. It is necessary to bring in the notion of developmental phases (like an applied science of medicine for human settlements), as a classification which only refers to a static situation may confuse the situation instead of clarifying it.

Classification by basic dimensions (division and class)

By starting with measurements we can follow a process step by step, each step based on one or a few characters because if we use too many characters we can get very confused. I present here the very first step. It covers three dimensions, but I start with the first two: population and territory. This is not a new approach; experts like Berry and Garrison have stated that "city-size relationships is a base on which to build or to relate city-size relationships to other relationships."[10] But it is only a base. We need a total approach.

The Ekistic Population Scale (EPS) (table 2) starts with unit 1 (Anthropos or a single individual). The next unit is two individuals (from early needs for contact and dependence on another person to sexual relations, marriage, etc.). The third unit is the nuclear family (estimated as 5 members because present averages range between 4.4 and 5, omitting China). After the family unit we proceed by multiplying each successive ekistic unit by a standard figure of seven.

The Ekistic Territorial Scale (ETS) (table 3) starts from the total habitable land of the globe which I have taken to be 135,750,000 sq km (excluding the Antarctic). I then proceed on the basis of the only practical theory of spatial organization, which was developed by Christaller.[11] His division on the

Table 2
Ekistic Population Scale (EPS)

Ekistic Population Scale		Persons
15	Ecumenopolis	69,206,436,005
14	eperopolis	9,886,633,715
13	small eperopolis	1,412,376,245
12	megalopolis	201,768,035
11	small megalopolis	28,824,005
10	metropolis	4,117,715
9	small metropolis	558,245
8	polis	84,035
7	small polis	12,005
e	village	1,715
5	small village	245
4	housegroup	35
3	family	5
2	couple	2
1	Anthropos	1

Table 3
Ekistic Territorial Scale

Ekistic Territorial Scale		Square Meters
18	biosphere	
17	all habitable land	135,750,000,000,000.000
16		19,392,857,000,000.000
15		2,770,408,000,000.000
14		395,772,000,000.000
13		56,538,000,000.000
12		8,077,000,000.000
11		1,153,850,000.000
10		164,836,000.000
9		23,548,000.000
8		3,364,000.000
7		480,570.000
6		68,650.000
5		9,800.000
4		1,400.000
3	house	200.000
2	room	28.059
1	human bubble	4.084
— 1	standing person	.583
— 2	squeezed person	.083

basis of hexagons has proved the most reasonable one in a number of cases. The Ekistic Territorial Scale moves from the total habitable land down to unit 1, corresponding to the human bubble of 4 sq m, to unit -1, for standing persons, and to unit -2, for persons squeezed together to the maximum possible degree.[12]

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Figure 2 shows the three hundred possible interrelationships of these two most important characteristics, population and territory.

But we cannot classify anything properly on this basis unless we also consider a third characteristic, that is the main economic function of the human settlement.
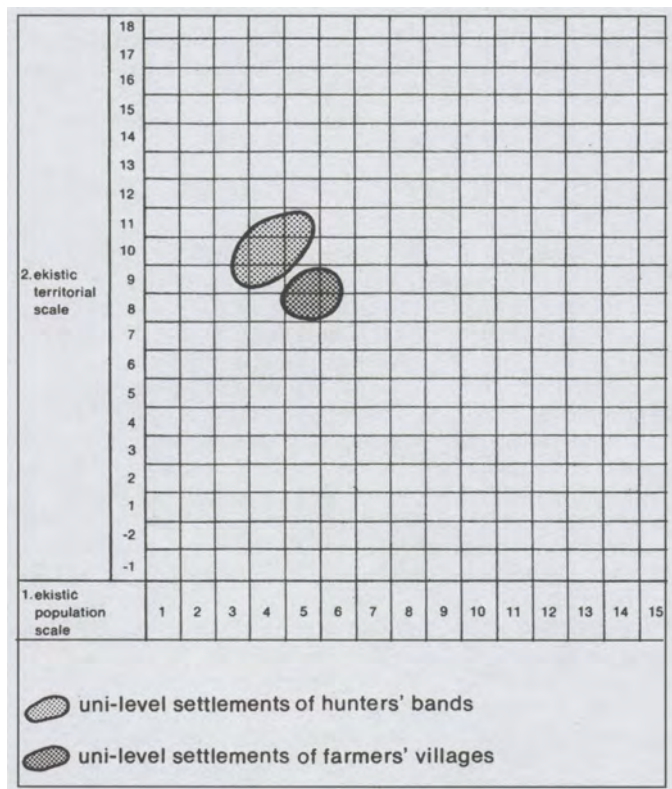
Fig. 2: Classification of uni-level human settlements on the basic two characters: population and territory.

The human settlement is then examined in terms of the five elements (Nature, Anthropos, Society, Shells, Networks). For example, general population density in any of the four areas is a relation of Nature and Anthropos in the total area, whereas housing density is measured by Anthropos and Shells; etc., in relation to a specific part of the Anthroparea.

The model of structure and function is the basis for classification of genus, section, and series (see table 1).

Without time-dimensions, interaction and function do not exist in any living system. Thus figure 3 demonstrates the in-

Fig. 3: The model of structure and function.

Classification by central and peripheral (order)

The characteristic that describes the order under which any settlement should be classified is whether it has one level (like the territory of a hunting band or a very isolated village) or many levels (its own territory plus that of other settlements which depend on it for central services and/or serve it with their products). For example, as megalopolises may range from below 28 to above 201 million people, we can classify the Roman or Chinese Empires and the US Northeast Megalopolis as megalopolises on the population scale, but there are enormous differences in the territory each covers. Furthermore, Imperial Peking (with one million people) must be distinguished from a modern small metropolis (also with one million or more people) because Imperial Peking served a much greater area and population than the modern small metropolis.

Classification by structure and function (genus, section, series)

Structure and function depend in the first instance on the four areas (Naturarea, Cultivarea, Anthroparea and Industrarea), in terms of their interrelationships, dimensions, and location.

teractions between the five elements and the human settlement in terms of time.

The divisions on the ordinate of figure 3 record the forces that have created the human settlement, whether it grew "naturally" over time, was deliberately planned, or both. The divisions along the abscissa record when the various events or actions took place and how long they lasted. It is here that the distinction can be made between static and dynamic settlements (dynapolis).

The series relates to the forms of the physical structure of the settlement, which may be radial, orthogonal, etc.

Classification by human satisfaction (species, variety)

Basic dimensions are some of the criteria for identity, taxonomy and classification. An elephant and a rat are very different not only in size, but also in many other ways. Thus we have not only to separate criteria in terms of dimensions, structure, function and time, but also by quality and the satisfaction created.

To deal with this very difficult question of happiness or satisfaction, we turn to five principles[13] which have guided Anthropos throughout history (fig. 4). These can help us to evaluate many dimensional and nondimensional problems in

relation to satisfaction. For example, the density inside the Anthroparea in relation to Shells can provide an answer to the satisfaction of the third principle of protective space. However this answer is not complete, unless we clarify the aspect from which we evaluate the situation: economic, social, political, administrative, technological or cultural. Our judgment here also depends on whether we are considering desirability or feasibility (fig. 4).

This model enables us to clear up some of the confusion concerning the meaning of satisfaction. If some inhabitants of a small and beautiful "ideal" town say that they do not like it because it does not have a university, a big hospital and enough jobs, this means that they do not like this species of settlement, and would prefer a big city (metropolis, etc.), because a small town cannot contain a big university, a big hospital and many types of jobs. A cat can be the most beautiful cat in the world, but a person may hate it because he likes only horses or dogs. In this case, it is not a matter of quality, but of a different kind of animal. Through this type of approach we can also learn whether another "ideal" town which is beginning to be abandoned (because of no satisfaction of the first and second principles) could solve this problem by becoming properly connected through high-speed routes and also whether such action is feasible or not.

5. aspects / 6. principles	Desirability					Feasibility				
	Economic	Social	Political	Technological	Cultural	Economic	Social	Political	Technological	Cultural
1. maximum of contacts										
2. minimum of effort										
3. optimum of protective space										
4. optimum of quality of the total environment										
5. optimum in the synthesis of all principles										

Fig. 4: The model of satisfaction.

The total model

Through continuous classification we have reached the point where the total model of the Anthropocosmos (which incorporates dimensions, parts, elements, structures, functions and criteria) can help us to conceive the ideal yet feasible human settlements that we need. In completing this total model (fig. 1) we can understand how the structure and function model represents a very small part of the basic dimensions model,

and the satisfaction model a very small part of the structure and function model (fig. 5). The total image, which incorporates everything in the same grid (fig. 1) provides a framework which can explain all the dimensional relationships, although it is quite clear that, in the simplified way in which it is presented here, it does not incorporate every order of dimensions, elements, etc.

But what such a model has to achieve is the creation of a frame for every type of work, from simple concepts during discussion or thinking, to the creation of systematics, classification and taxonomy, to the preparation of algorithms, to operations research, and finally to exact calculations by computers (for which reason it has to lead to code numbering).

Selection and evaluation of data

Once we come to an agreement (even a tentative one) on Anthropocosmos and the Anthropocosmos model, we have to collect and evaluate data on certain human settlements representing the global situation.

Within the frame of our effort as a World Society for Ekistics this can be done only on the basis of some human settlements which have to be representative of the global situation in order to lead towards some first conclusions about them.

The human settlements to be selected must range from at least one megalopolis to hunter's settlements.

The cases to be selected should be human settlements of several taxa, where realistic implementation programs have either been completed or are under way. We certainly will not find any megalopolis with such a program under way – it has not even been conceived – but we can find programs for smaller human settlements which will be worth presenting, evaluating and judging.

Following the final and coordinated evaluation of the global situation of human settlements and their problems, we will move into the future, because no action (even magical) can save the present situation. The period of 1976 to 1980 is needed for the preparation of detail plans, organization, financing programs, etc., using the data obtained. Beginning with 1980, we should be able to make projections for the next sixty to one hundred years, and list the problems that can be faced over ten-year periods.

Notes

1. I change the word Man to Anthropos, meaning all humans no matter what their sex, age, etc. (see *Ekistics*, vol. 37, no. 222, May 1974, p. 305).
2. C.A. Doxiadis, "A city for human development: eighteen hypotheses," *Ekistics*, vol. 35, no. 209, April 1973, p. 177; C.A. Doxiadis, *Anthropopolis: City for Human Development* (Athens Publishing Center, Athens, 1974).
3. C.A. Doxiadis, "A United Nations Organization for Human Settlements," *Ekistics*, vol. 17, no. 101, April 1964, pp. 219-226.
4. *Habitat 76*, "United Nations Conference-Exposition on Human Settlements," Vancouver, Canada, 31 May – 11 June 1976. Report by the Preparatory Planning Group submitted to the Executive Director of the United Nations Environment Program (31 December 1973), p. v.
5. Sir Julian Huxley, *The Uniqueness of Man (London*, Chatto & Windus, 1941).
6. G.G. Simpson, *Principles of Animal Taxonomy* (New York, Columbia University Press, 1961), p. 11.
7. Robert R. Sokal and Peter H. A. Sneath, *Principles of Numerical Taxonomy* (San Francisco and London, Freeman, 1963), p. 3.
8. *Ibid*, p. 11.
9. Karl Patterson Schmidt and Alfred E. Emerson, "Taxonomy," in *Encyclopaedia Britannica*, vol. 21 (The University of Chicago Press, 1970), pp. 728-731.
10. Harold M. Mayer and Clyde E. Cohn (eds.), *Readings in Urban*
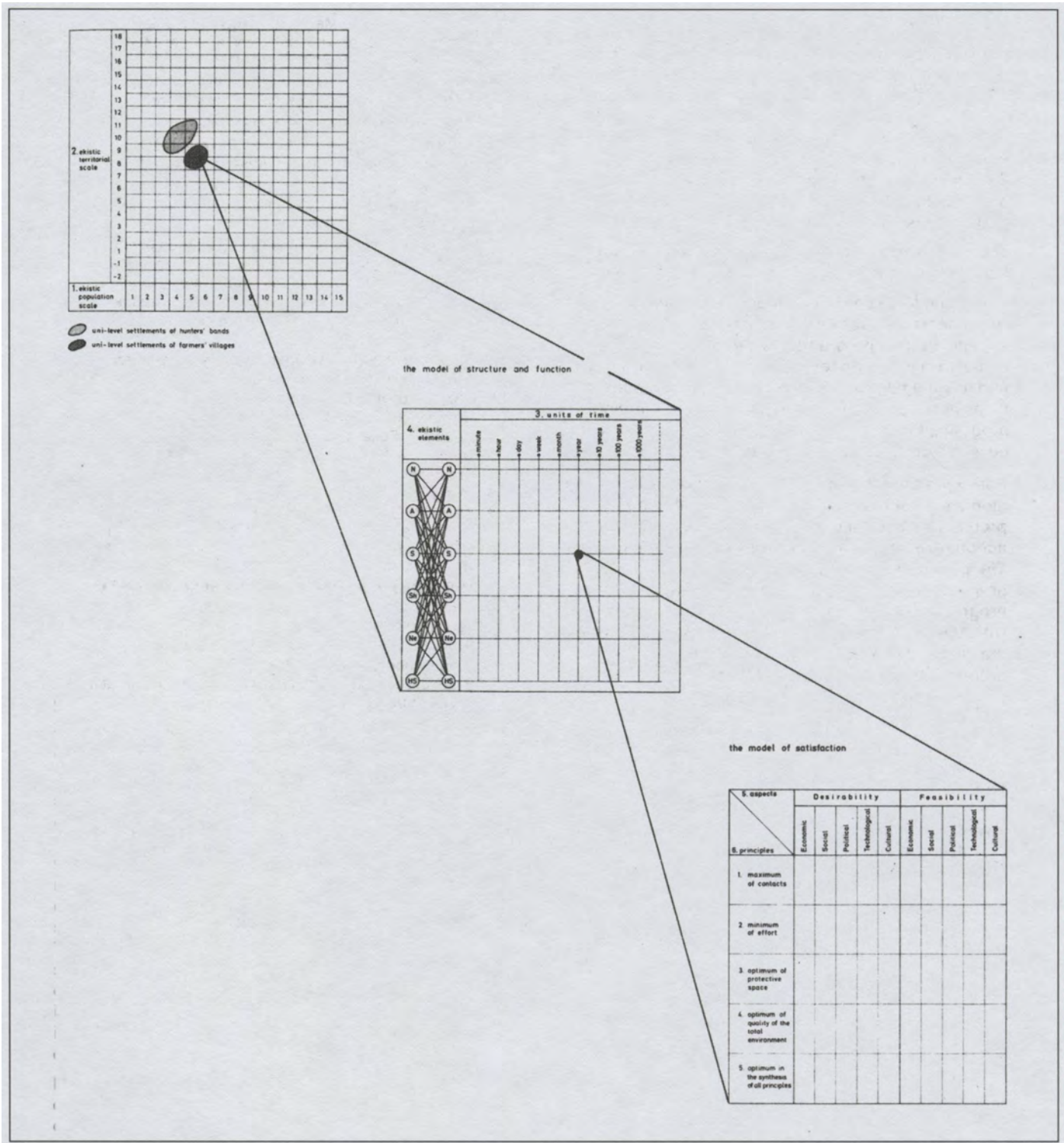
Fig. 5: Combination of the three models into the total one.

Geography (The University of Chicago Press, 1959), p. 239.
11. W. Christaller, *Central Places in Southern Germany,* trans. C.W. Baskin from the German edition of 1933 (Englewood Cliffs, N.J., Prentice-Hall, 1966); Brian J. Berry and William L. Garrison, "The functional bases of the central place hierarchy," in Harold M. Mayer and Clyde F. Kohn (eds.), *Readings in Urban Geography* (The University of Chicago Press, 1959), pp. 218-27.
12. E.T. Hall, *The Silent Language* (Garden City, N.Y., Doubleday, 1959); E.T. Hall, *The Hidden Dimension* (Garden City, N.Y., Doubleday, 1966).
13. C.A. Doxiadis, "Five principles for the creation of human settlements," *Ekistics,* vol. 28, no. 167, October 1969, pp. 223-25; C.A. Doxiadis, "The future of human settlements," in Arne Tiselius and Sam Nilsson (eds), *The Place of Value in a World of Facts* (New York, London, Sydney; Wiley Interscience Division, John Wiley and Sons, Inc.; 1970), pp. 307-38.
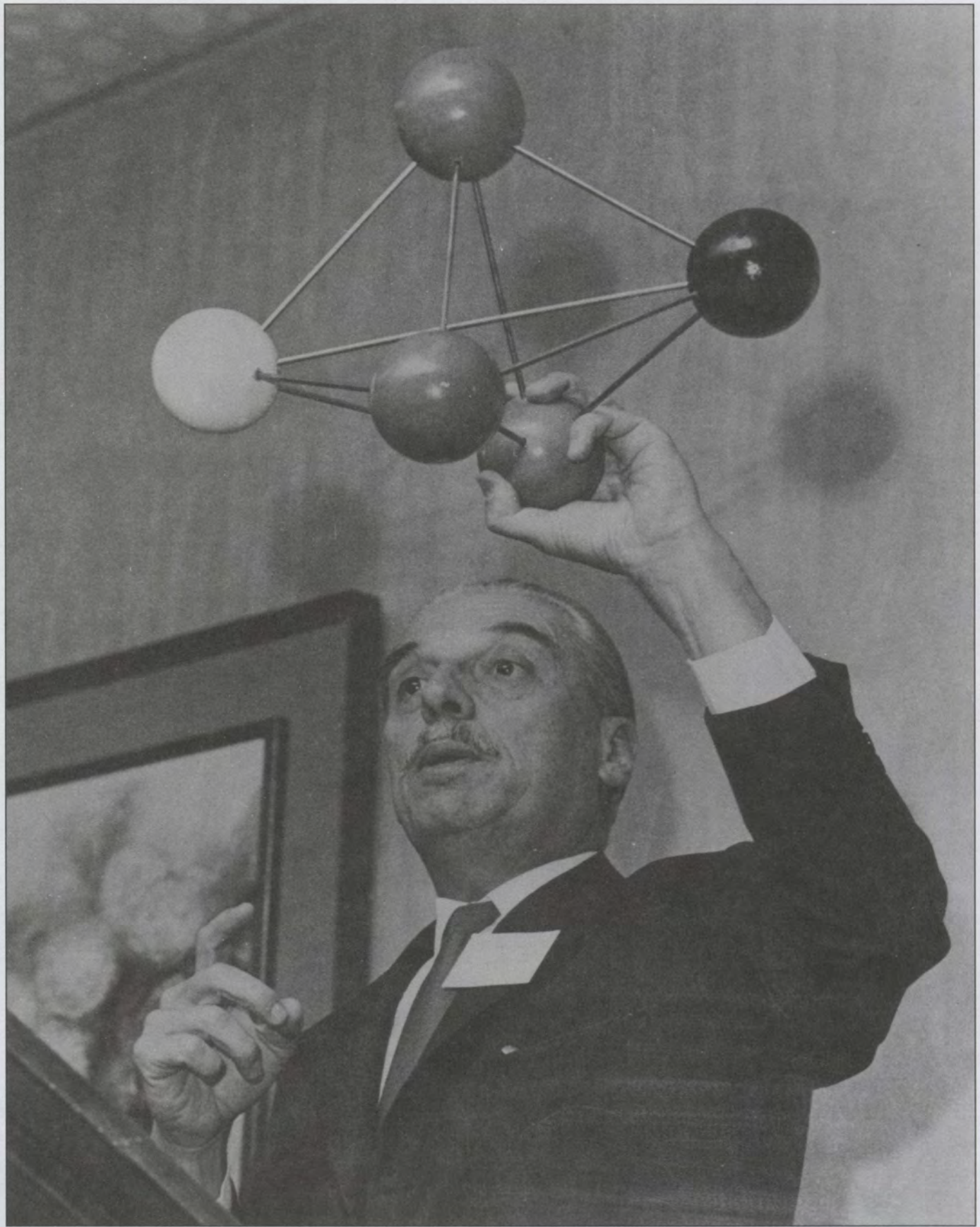
C.A. Doxiadis lecturing at the Seminar on Regional Planning organized by Kent State University in cooperation with the Aspen Institute for Humanistic Studies, Aurora, Ohio, 20-25 October, 1967. (*Source:* © Constantinos A. Doxiadis Archives of the Constantinos and Emma Doxiadis Foundation).

The universal urban crisis

Introduction

The urban crisis is a universal phenomenon. Whether mankind deals with large or small cities, with countries of high or low income, developed or undeveloped, it is invariably faced with an urban crisis. This may appear in different forms and may not always be understood as such. Very often, in fact, it is not even recognized as a crisis. The reason is that the symptoms may vary. In some cities the crisis may appear as a grave traffic problem, a waste of natural resources, a social, economic, technological or human problem. Any systematic study of the urban crisis will, however, show that it is indeed a very large and universal phenomenon which started in the 19th century and is developing at a much higher speed today.

Because of the great number of forces affecting the urban scene – and there is no type of natural or man-made force which does not do so – cities and the crises they are passing through are very confusing and difficult to cope with. Many cities have many projects; some to solve problems of transportation, others to beautify certain areas or create important new communities. But there is hardly a city today, whether large or small, whose leaders pretend that they have taken the measures that can guarantee citizens a better future for their city.

The situation has reached threatening proportions and is becoming more menacing every day. At first, the urban crisis was not even recognized. And when recognition came, the phenomenon was not regarded as a real urban crisis: a problem affecting the whole system of urban settlements. It was thought to be a crisis only in the residential areas which were seen as slums; a crisis of low-income groups lacking proper homes; a crisis in the system of transportation; or a crisis in the quality of air and water. Even when groups of citizens protested, either because they themselves were suffering or because the whole system was under strain, the problem was not readily recognized as a crisis of the whole system. Almost everyone was speaking only of a partial crisis of the system, or accusing those who were speaking about the crisis of unnecessarily frightening other people.

It was only in the 1960's that the extent of the urban crisis began to be fully appreciated and recognized by city governments, national governments and international agencies all over the world. It may be doubted, however, whether it is viewed everywhere as a problem of the city in its entirety.

When people speak of an urban crisis, they usually refer to that part of the crisis related to a single symptom which causes them the worst problems. Others do not look upon the phenomenon as a crisis because it is not, according to them, accelerating at the high speed that would justify the definition of a crisis, or because it will not spell the death of cities. We do not agree simply because many cities all over the world continue to deteriorate, and because death has indeed already struck large or small parts of these cities.

The main causes

What is really happening to our cities? What are the forces that are working to make them less than the most desirable places to work and live? Why does man have to face a situation that looks like a disease of the whole system as well as a real accelerating crisis?

Some people speak of the expanding size of cities as the main cause of their problems. "Large cities are unmanageable" is a current complaint heard from many expert sources. Man, however, has demonstrated his ability to successfully manage large and widespread institutions, corporations and national governments. If it is remembered that most of them have reached their present proportions over the last one hundred years, parallel with the growth of cities, it is further shown that man is more capable of dealing with problems of large dimensions than presently demonstrated in the cities. If one also considers that in biology there are organisms consisting of many parts much larger than the initial organisms, be they atoms, micromolecules or cells, it will be seen that size alone cannot be blamed as the cause of city problems.

The high rate of growth of cities, particularly in the last one hundred years, is also often mentioned as the principal cause of the city's problems. However, if it is remembered that in the past people built cities at much higher speeds, starting from nothing and actually building new cities in areas without any facilities or rebuilding ravaged cities; that private and governmental institutions such as large corporations or armies have grown at much higher speeds; then one can say that humanity has dealt successfully with organizations and institutions which have developed at much higher speeds than cities. So, rapid growth cannot be singled out as the main cause of the problems in the city.

A systematic study of growing cities around the world shows that the crisis may be explained in two ways.

• The first way is that the city – a system of people living together, pooling their energies, and developing a community with a common economy – is growing out of balance in certain areas. In the past the number of people were growing at the same rate as the energy they produced, and economic growth was a direct result of the growth in the number of people and their energy. Therefore, the city was a system where people, energy, economy and physical formation
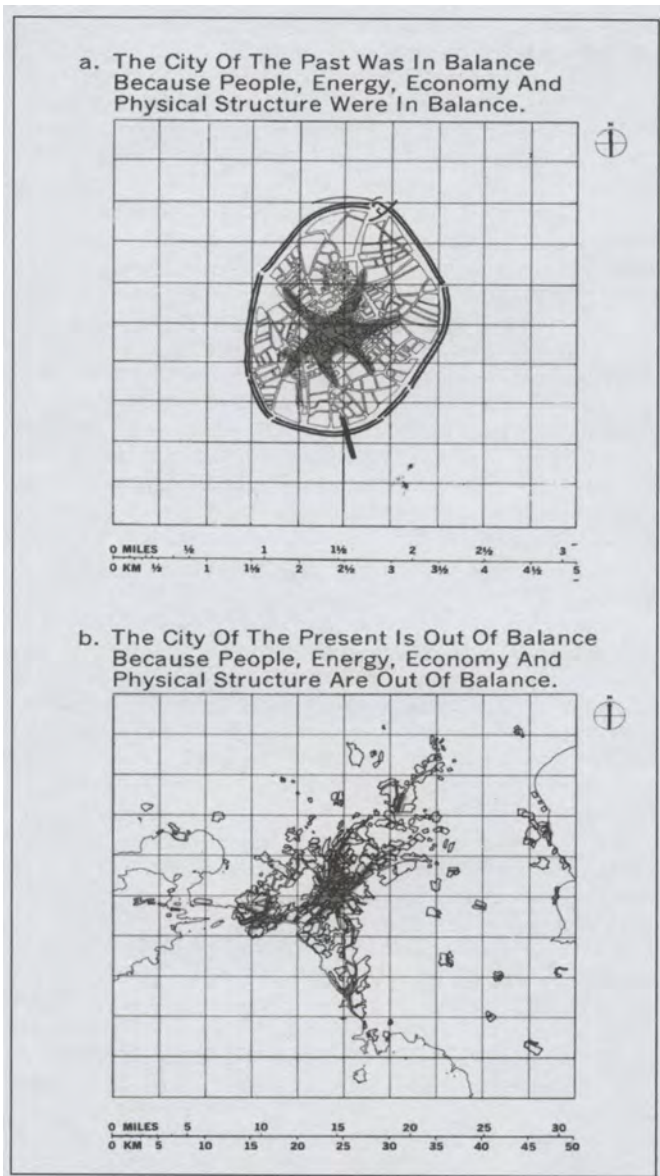
Fig. 1: The city of the past and the city of the present.
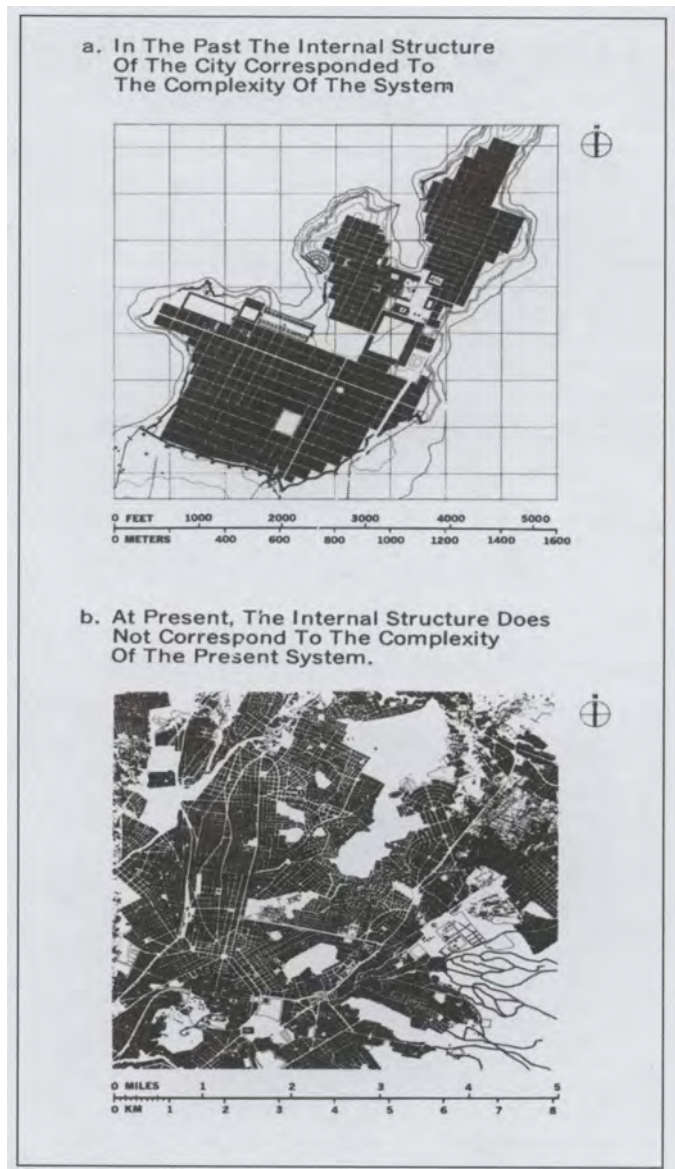
Fig. 2: The structure of the city.

were in balance (fig. 1a). During the last hundred years, because of the differing rates of growth of population, energy and economy, systems have developed which lack balance (fig. 1b). For example, people in general go far out of the cities because the commercial forms of energy help them do so, only to recognize afterwards that by their action they have led to a system which they cannot support properly in economic terms. They are faced with numerous problems which affect all of them, or for the most part and to a greater extent, the weakest economic groups.

• The second way to explain the crisis is that the city, like any other growing system, develops an increasing degree of complexity which is always served, in nature or in society, by corresponding physical and institutional structures. The cities of today have not yet reached the stage where they have a structure serving their increasing complexity in the same way as the structure of a century ago served the complexity existing in those days (fig. 2). In this respect, the situation is getting worse.

From these observations one can conclude that neither size nor rate of growth alone is the cause of the problem; instead, lack of balance and proper structure in the cities. It might be true that the size of cities and their rate of growth are at the origin of the problem. This, however, is not because either size or rate of growth cannot be managed, but because within the big, growing cities man is not able at present to deal with these problems. He has not been able to achieve the needed balance of forces and to provide the proper physical and institutional structure as he did in the past.

The fact that man is still not able to control the size and speed of growth of cities creates a crisis. The real cause of the problem, however, is the gap which exists at present between size and speed of growth of cities and man's inability to cope with them. He cannot even pretend that enough is known about these problems since it is admitted that not even the existence of the crisis was recognized before the 1960s and that, today, it is not appreciated in its full extent.

There are many cities and urban areas in the world about

which hundreds and thousands of reports and plans have been drafted over the last twenty years. People are beginning to ask what can be done with all these reports and plans. There are, in addition, knowledgeable people in business and science who are beginning to question whether there are indicators to show the gravity of our cities' problems. Because of the lack of even basic tools, such as indicators of the different phenomena, many of the reports and plans do not shed sufficient light on the problems confronting us. There exist reports on the same city which do not show how life will be changed by the acceptance of a new plan. In some cases, reports even contradict each other because they are not aimed at any specific goal, are not inspired by the same principles, or do not use a consistent methodology.

Man's inability to control the crisis

There are four main reasons why man seems unable to control the urban crisis.

a. It Should Be Seen As Such

b. But We Deal With It By Isolating Its Parts.
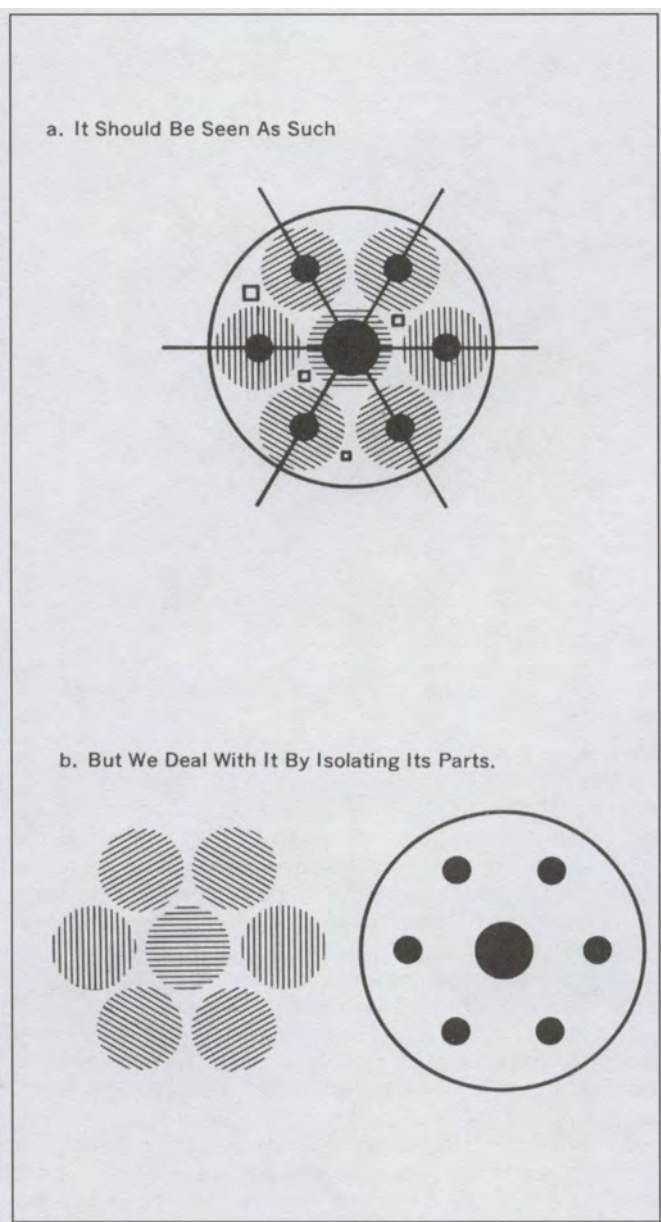
Fig. 3: The real city is one organism.

• Man often continues to see the city through the eyes of experts in separate disciplines dealing with single aspects of city life. People speak of the transportation problem and try to solve it through the transportation engineers or the transportation economists only, in many cases without even bringing these two professions together. Cities suffer from the social aspects of the crisis and try to solve them by mobilizing only the sociologists or other social scientists. Man suffers from air or water pollution and tries to deal with these as separate problems, or looks at the aesthetic problem of the city only through the eyes of the architect or the artist. All these problems are simply aspects of one and the same organism: the city of man (fig. 3a). To continue to deal with them separately by isolating its parts (fig. 3b) is like refusing to see that man himself is a single organism which cannot be looked at separately as body or senses or mind. Medicine for man has made far greater progress than medicine for cities because it has developed an effective interdisciplinary approach. The. interdisciplinary approach is beginning to be tried in many cities today, although it has not yet produced a real synthesis.

• The second reason for man's inability to control the crisis is that he is still dealing with the wrong area and the wrong size. Many people think of the city as built-up areas only (fig. 4a). Others believe that the city is limited within the institutional boundaries of the municipality (fig. 4b). The real city of man, however, has always been defined by his ability to move within a certain area, within a certain time-span and always within the same day. Since the dawn of history, the city has been defined by the kinetic field of man who had the ability to move around and form his small village community, his city or his metropolis. This was followed by establishment of the appropriate institutional structure. Today, the individual man who lives in one city and works in another, whose wife works in yet another city, and whose children go to school somewhere else, views the whole area as his city, but many people still fail to see this (fig. 4c). Someone is referred to as a farmer because he works on a farm and is thought of as an isolated inhabitant of the world, as was the case a century ago. But nowadays, he may work on his farm during the day and still be able to attend an evening class in the nearby city. Moreover, his wife may have a job in another city. He is no longer a village dweller; he is the inhabitant of a great city of man (fig. 4d). The city has changed, but this fact still has not been sufficiently recognized in studies for the future.

• The third reason for man's inability to control the urban crisis is that he still thinks in a very narrow time-frame. When planning for the future, when preparing to build better cities, people think of one-, five- and ten-year programs, whereas this is a system whose main parts, the people and the buildings, have an average life-span of seventy years. There are parts, such as roads and facilities, which have a much longer life, not in physical terms, but in terms of the commitments they create with rights-of-way, etc. Though the time schedule for the city as a whole should be longer than the life expectancy of its parts, probably twice as long – up to 140 or 150 years – schedules are shorter than those used by man himself when planning for his own life, security, safety and settlement. It can be seen how inadequate this approach is if one looks at the urban system and how it grows under the impact of forces arising every ten years. In fact, it will be seen that in every generation, which has a length of about thirty years, there are ten new groups of people, buildings and projects entering into the picture and disappearing about seventy years later. In such a system, committed by action everyday for more than seventy years, mankind tries to cope with the situation by means of one-, five- and ten-year programs. Such action contributes to great failures of insight and of solutions (fig. 5).

wrong conception of Human Settlements based on built-up areas
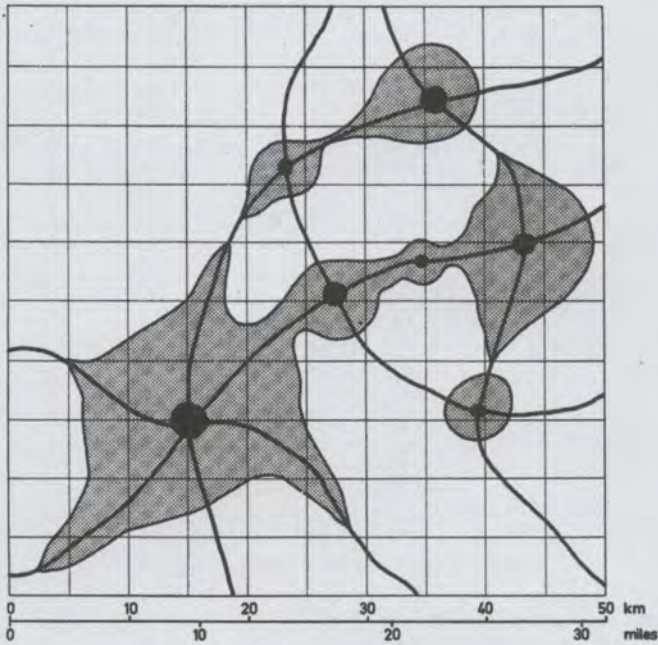
wrong conception of Human Settlements based on administrative boundaries
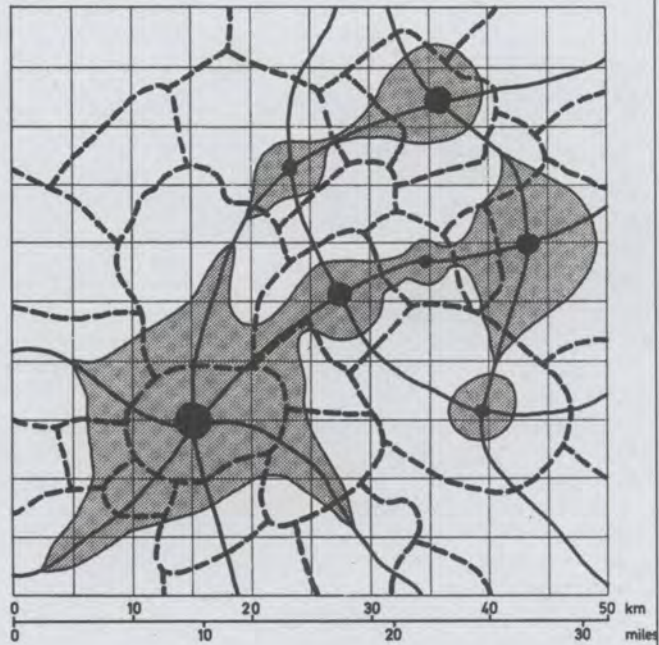
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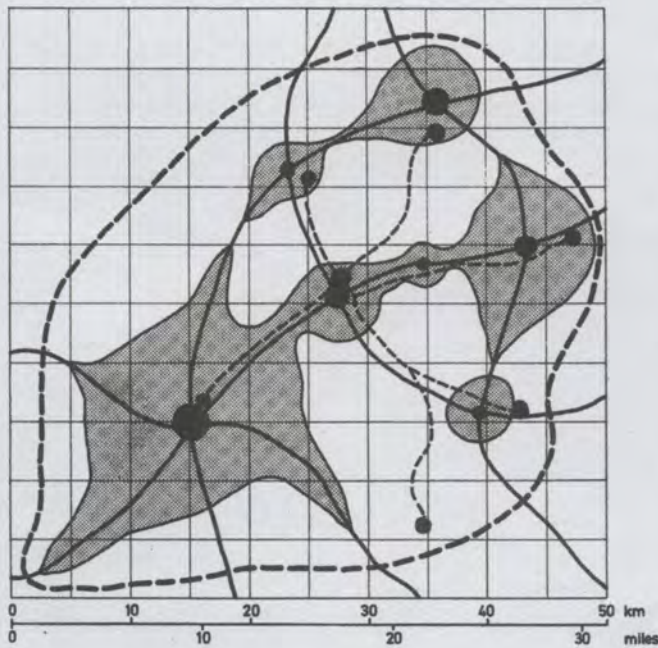
the real Human Settlements as defined by a "farmer"
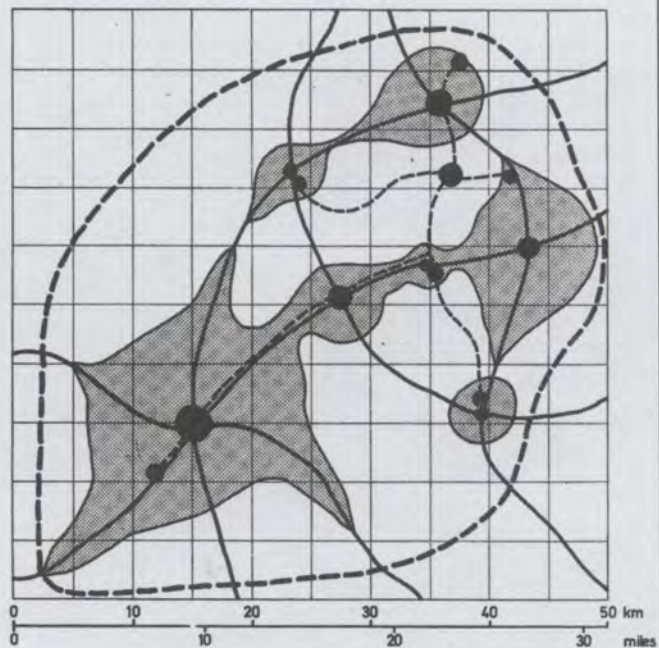
(Source: Reproduced from C.A. Doxiadis, "The Future of Human Settlements," a speech delivered at the 14th Nobel Symposium, *The Place of Value in a World of Facts*, Stockholm, Sweden, September 1969; printed by Doxiadis Associates as Document R-GEN-A443, September 1969, p. 3. Proceedings published by John Wiley, New York).

Fig. 4: The real city reaches beyond traditional boundaries.

• Finally, mankind at times takes a somewhat narrow perspective in looking into the future. Although his future is conditioned by four forces – the constant past, the declining past, the continuing past and the created future – too often his actions in city building are defined merely by extrapolating existing trends. This means that only the three forces of the past are considered. To forget these trends would be a grave error. But to forget the fourth force – the ability of man to create the future – leads to stagnation.

Can man control the crisis?

Is there any reason to believe that, if the urban crisis is so acute and if man has been unable to deal with it so far, he can ever hope to resolve it?

• This question may be answered in several ways. Every new problem is hard to solve at the beginning. The urban problem is greater than man's other problems, hence the difficulty is even greater. But there is no reason to believe that he cannot cope with it.

• A second answer to this question would be to look at all the forces at play in the urban system: the number of people, the built-up area, the economy, and the energy mobilized within the system, and to see that they grow steadily.

• There is one aspect of the city for which the indicators grow faster, and this is its complexity. Although there is no generally accepted method of measuring complexity, no matter how it is measured, complexity grows faster than the other aspects of the city.

• There is only one other force which seems to grow even more rapidly than the complexity of the system, although this cannot yet be proved. This is human knowledge. The study of trends encourages the belief that mankind can mobilize human knowledge to grasp and face the urban crisis and definitely resolve it.

Also, man now recognizes the problem, whereas ten years ago he did not. Experience has shown that once man is able to recognize a problem, even one not created by him, such as diseases of the human organism, he can develop the ability to solve it. He has brought numerous diseases under control and he is on the road to tackling many more. The same can justifiably be said about cities.
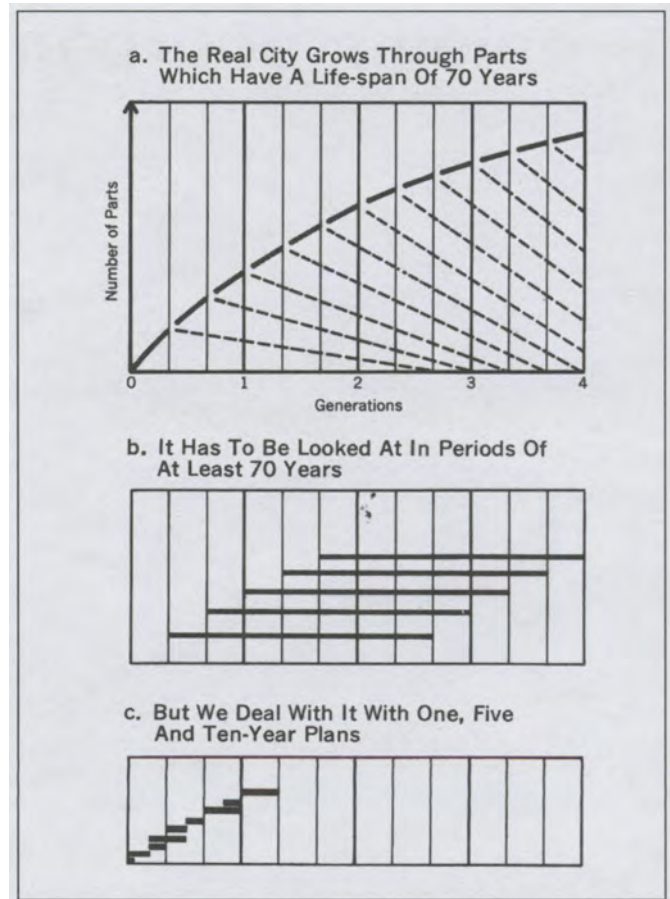
Fig. 5: The wrong and real time schedule.

As a result of the exploding force of human knowledge, man now has a chance not only to grasp the problem but to analyze and understand the city and its crisis and then to develop the right ideas about how to overcome it. Combining this with the wisdom needed for action, the conclusion may be drawn that humanity can successfully overcome the urban crisis.

Problems of urban renewal

Introduction

The task

For the last thirty years I have been trying to develop, as well as to practice, a comprehensive view of human settlements leading to "Ekistics, the Science of Human Settlements." Nothing less than an organized science can help us understand their complicated problems. If we continue to believe that we can undertake to solve these problems through urban economics, urban sociology, physical planning, or architecture, we shall certainly fail. The problems of human settlements have always been very complicated; but because humanity has lived in small, practically static, settlements for thousands of years, we have never before had a crisis like the present one. It is only now that it has become apparent that without an overall, systematic understanding of the problems of human settlements we cannot solve them. It is too early to say when we shall be able to perfect this new science. What we can definitely state, however, is that we need a scientific multi-disciplinary approach. This is the road I have chosen for myself. It is with this knowledge, however little it may be compared with what we need, that I try to look at this complicated contemporary problem of the major human settlements in the United States.

When I was confronted with the task of writing a report on urban renewal in the United States of America to be submitted to the National Association of Housing and Redevelopment Officials who deal daily with this problem and know so much about it, I asked myself whether I was entitled to write this report and what my contribution might be. It took me some time to understand my role in fulfilling the task assigned to me. Finally, I came to the conclusion that I had been asked to undertake this task precisely because of my noninvolvement with the technicalities and the day-to-day operational problems of urban renewal. My role was that of an outsider who could view the whole situation from a distance, to evaluate its weaknesses and its strengths, with the purpose of helping toward a better understanding of present problems, future policies, and programs.

After considering several methods of approach, I decided to study the situation without becoming involved in the details of the urban renewal program. Although I had to learn about many problems, I wanted to keep at a distance that would allow me to have the proper perspective.

At the same time, however, it became apparent that I could not speak only of generalities, that I had to get a clear picture of the situation as it had developed. In this, I was especially helped by the fact that during the three years after we started talking about this problem I was personally connected with several urban renewal projects, such as Eastwick in Philadelphia, Pennsylvania, Parktown in Cincinnati, Ohio, Riverfront in Louisville, Kentucky, and Northwest 1, in Washington, DC.

These two aspects of the work that I had to carry out, which were to some extent contradictory, had to be merged and balanced in a way that would enable me to approach the problem of urban renewal effectively.

When I reached the conclusion that I had, on the one hand, to remain as far away from the details as possible but, on the other, to learn as much as possible about the problem, it became clear that I had to work in two ways and try to create a synthesis out of them. One way was to proceed through the anatomy of a special case, to find out what is happening within the American city of the present, in order to understand the necessity of urban renewal and its effects on the city. The other was to learn as much as possible about the whole existing situation of American cities by a survey of problems and solutions.

Within the limitations of the time and the facilities at my disposal for this project, I tried to work in both directions simultaneously. I proceeded in this manner for about a year, until I reached the point at which I tried to synthesize these two methods of approach in order to reach my conclusions.

Anatomy of a special case – TURA

When I speak of proceeding through the anatomy of a special case, I mean the study of the elements of one representative case as a means of clarifying general problems and their solution. The method is relatively simple if we have a great number of similar cases that have developed in a similar way. Then we can generalize our findings and reach conclusions valid for all similar cases. But the question was whether we could find a city whose problems of urban renewal were typical.

After studying several cities I found that it was too early to speak of one city typifying the problems faced by all cities, since there is such a variety of cities and such a short history of attempts to renew them. I, therefore, came to the con-

clusion that I should have to use an imaginary city with many characteristics common to most cities facing problems of urban renewal. In this way we would gain by constructing a model that would be more representative of the average situation than any single real city. This was the only method that could lead to useful conclusions at this stage of our work.

When I tried to imagine such a city, I found the problems could not be confined within the city limits. I therefore decided to construct as complete an urban area as possible, without trying to define in advance whether it should be a city, a metropolitan area, or a part of one or both. I let the case itself guide me about the type of area we should have to use.

I thus came to construct TURA, which is a Typical Urban Renewal Area. By "typical," I mean representative of many of the characteristics common to most American cities facing urban renewal. By "area," I mean an urban area that can be distinguished from adjoining urban areas by intervening open spaces and by the fact that it has its own core of functions providing all necessary services for its whole area. I do not mean the area of an urban renewal project but the area of TURA, our study, which is as complete an urban entity as possible.

Thus, TURA is an imaginary urban area. It has been constructed to be used as a typical case study that will lead to an understanding of the problems of many of our urban areas. If it has been wrongly conceived, it will be misleading, but I had to face this risk. In order to minimize it, I checked my model with as many people as I could who have a good knowledge of the American scene, and their criticisms led me to make several alterations that made it as typical as it could be at this stage of our study.

I had to take certain risks; but I thought I could reasonably run them because of my wider involvement with problems related to the evolution of present-day cities in several parts of the world. The studies, which have assisted me enormously in conceiving properly the model of TURA, are mainly the studies of Dynapolis, the dynamic city, which I have been carrying out now for the last twenty-five years; the study of Ecumenopolis, or the City of the Future, which is being carried out under my direction in the Athens Technological Institute; and the study on the Human Community within our urban areas, which is being carried out by the same Institute.

Had it not been for these specific studies, and other more general studies that I have been making, I do not think that the model of TURA would have been as close as I believe it to be to the real situation.

Survey of urban renewal experience

Parallel to the study of the anatomy of a typical case I had to carry out a survey of the experience gained in urban renewal. Here, I had to face the difficult task of selecting a method of survey that would be practicable in relation to the limitations of time and money. In this respect I was also fortunate, as years of travel in the United States and visits to a number of cities had equipped me with a personal archive of impressions related to urban renewal problems.

Thus, I had the opportunity to use the experience of such cities as Baltimore, Boston, Cincinnati, Louisville, New York, Norfolk, Philadelphia, Pittsburgh, San Francisco, and Washington, where I had already met a number of the city officials and gained from their impressions and reactions. I also had had the opportunity of discussing with many more people, including developers, consultants, and leading citizens, their views on urban renewal problems.

The study of existing situations was divided into two phases: the first was a study of the literature and collected data on cities with urban renewal projects; the second was an analysis of the answers to questionnaires directed to all NAHRO members.

In surveying the literature and collected data, I turned to studies of problems of urban renewal, general or specific, and to officials who could provide me with specific data about their cities.

After this initial survey had acquainted me with some of the most interesting problems and cases, I undertook a study of many more through the questionnaire that was sent to all NAHRO members. Many of these people are the key members of Local Public Agencies (LPA's) engaged in urban renewal, and thus I secured the reactions of many people who are running such agencies. Of necessity, the questionnaire was general. It is, therefore, not possible to use the results of this survey as an accurate statistical description of the situation or of opinions about urban renewal; nevertheless, the survey acquainted me with a much greater number of problems and reactions than could otherwise have been obtained in a one-man study.

The 1960 census (the baseline for this study) showed 5 American cities with over 1,000,000 population. All these cities have urban renewal projects, all have urban renewal authorities, and all are NAHRO members; all sent information and data and 4 (80 percent) answered the questionnaire.

Of 16 cities with from 500,000 to 1,000,000 population, 15 have urban renewal projects, 13 have urban renewal authorities, and 12 are NAHRO members; 8 sent information and data and 9 (56 percent) answered the questionnaire.

Of 30 cities with from 250,000 to 500,000 population, 23 have urban renewal projects and urban renewal authorities, and 22 have NAHRO members; 10 sent information and data and 15 (50 percent) answered the questionnaire.

Of 79 cities with from 100,000 to 250,000 population, 53 have urban renewal projects, 52 have urban renewal authorities, and 37 have NAHRO members; 21 sent information and data and 32 (40 percent) answered the questionnaire.

Comparatively small percentages of cities with populations under 100,000 have urban renewal authorities and NAHRO members. For instance, of 2,037 cities with populations between 2,500 to 5,000, only 1 provided information and data, and for 27 there was indirect information – as they belong to the areas of larger cities that had responded. In the total group of cities under 100,000 population, 4 answered the questionnaire and for 37 there was indirect information.

These 5,304 cities, with a total population of approximately 113,000,000, constitute the urban part of the United States.

On analyzing this material it became clear that we had fairly detailed information relating to about 80 cities. Thus, we can speak with some certainty about cities of more than 500,000 inhabitants, with less certainty about cities of between 100,000 and 500,000 inhabitants, and with even less certainty about cities of fewer than 100,000 inhabitants.

The low percentage of smaller cities that have urban renewal authorities is not proof that the renewal problems in such cities are minor. Although many of them, especially those that are isolated and have remained relatively static, have few such problems, other small cities that are parts of major urban areas have suffered from the pressures of the major centers and many have grave renewal needs. For them, the lack of an urban renewal authority may well mean that they have no one in an official position who understands the gravity of the problems facing them.

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Content of this report

This report consists of three main parts:
a. Chapters B and C present the urban renewal problem and its causes.
b. Chapters D and E attempt a critical re-examination of human settlements, in the light of which we proceed to study their future, particularly in the United States, in order to set the framework within which we shall have to re-examine urban renewal as it relates to the future.
c. Chapters F and G make some proposals for urban renewal policies and programs for the future and attempt to draft a blueprint for action.

The background of urban renewal

The problem

When I started working on the problem of urban renewal, I was not aware of its magnitude and complexity. I looked at it simply as a problem in renewal and, very much like others concerned with the problem, thought of it as a problem of urban renewal projects. But the more I worked, the more I found that the problem touched all other ekistic problems, and could only be faced within the framework of the total problems of the American city.

I have, therefore, gradually moved from the specific to the general: from the urban renewal project to the urban renewal program, urban renewal policy, and the definition of goals for urban renewal. Thus, gradually, I found myself thinking and working on the future of the American city and every major problem related to it. I have expanded my subject to urban renewal within the framework of the growing American city – within the framework of a new way of living that is taking shape in and around all major American urban centers.

This widening of the subject, necessary to clarify our thinking and develop a systematic approach, may confuse some people who are directly concerned with the problems of local authorities. However, such widening was indispensable, not only for the solution of urban renewal problems at the national level, but even more for the solution of these problems at the local level and at the project level.

Without a broad view of the over-all problem, the local efforts do not have any meaning, and they may even work against the interests of the local authorities and the people of the smallest communities and the smallest project areas.

The changing American city

A study of the evolution of TURA shows the extent of the changes over the last 120 years. Its population increased about 100 times, from 10,000 inhabitants in the whole area covered by the metropolis to about 1 million. The built-up area has increased much more, from approximately 3 to 3,000 square miles, that is, about 1,000 or so times. The changes are even greater in some other aspects, such as power generated within this area 120 years ago and today.

There is very little in the present-day TURA to remind us of the city that started as a human settlement 120 years ago and is still struggling to be one.

The changes have accelerated during the last few decades as the increasing population and physical dimensions of TURA have necessitated drastic surgical operations. Highways and new lines of communications, for instance, have been cut through the body of TURA.

The example of TURA, even if oversimplified for the purposes of this study, convinces us of one thing: that the changing structure of our settlements creates a complicated and fluid situation. It is very difficult to analyze any part of such a changing city in some specific way, as practically everything is changing continuously. The changing structure of our settlements vitally affects everything related to urban renewal.

At present, continuous, dynamic changes are taking place in American cities and we have no reason to conclude that this fluid phase is over. On the contrary, everything related to the typical city leads us to believe that we are simply somewhere in the middle (if not at the beginning) of an era of dynamic changes in the city.

The beginning of urban renewal

The idea of urban renewal began to be developed in the United States in the 1930s, as a program directly related to certain slum clearance and public housing projects.

The Illinois Neighborhood Redevelopment Corporation Act and the New York Urban Redevelopment Corporation Act, both enacted in 1941, marked the first official actions in the field of urban renewal, although the term was not yet officially used.

It was the national Housing Act of 1949 that set broader goals. It dealt specially with "... the elimination of substandard and other inadequate housing through the clearance of slums and blighted areas, and the realization as soon as feasible of the goal of a decent home and a suitable living environment for every American family, thus contributing to the development and redevelopment of communities ..." This was the first time the word "redevelopment" was used in federal legislation.

In 1953, a committee of experts recommended broader, more comprehensive renewal. It encompassed "programs for slum redemption, for rehabilitation of existing houses and neighborhoods and for demolition of worn-out structures and areas which must advance along a broad unified front to accomplish the renewal of our towns and cities." In 1954, such provisions were incorporated in the Housing Act.

By 1960, more than 400 communities had an average of about two urban renewal projects each, ranging from small ones related only to some tens of families to very large ones affecting more than 10,000 families.

The goals

The concept of urban renewal initially was confined to the achievement of a physical renewal, but if we remodel a community we should set up an ideal for the life within it. If we set redevelopment of the community as our goal, we should not limit ourselves to physical renewal. We should aim at physical urban renewal as an expression of a broader redevelopment of community life. We should, therefore, consider urban renewal not as *the* ultimate goal, but as one among a number of goals, and at the same time as one of the means of achieving a better community life and a more vigorous economic development of the community.

I think it is true to say that most of the people concerned with urban renewal did not interpret it as an opportunity for creating a better way of life, but mainly as the necessity for creating a better urban environment. In short, there was no clear conception of a way of urban life that could be achieved through a good urban renewal program.

A clear conception of an urban way of life could give rise to an ideal physical form to serve it. This has not come about in urban renewal, any more than it has in any other aspect of our planned efforts to improve our cities. But this phenomenon is not confined to the United States; it recurs everywhere in our era. We are afraid to conceive the proper forms for our urban life, and thus we can have no proper physical expressions of these forms. In a nutshell, we have no model to present as our ideal city.

Not only do we have no specific goals for the area of a

complete settlement. We have not decided what is the proper size of the typical urban renewal unit either. If we want to proceed with urban renewal, we have to determine what is the size of the minimum unit to be considered as an urban renewal unit.

We also have no proper estimate of the total size of the urban renewal problem. If we ask any urban renewal director what is the total size of his problem, I doubt if we can get a specific answer backed up by figures.

If we cannot estimate our present needs accurately, how can we go on to determine the needs for the future?

When we asked about the specific goals of urban renewal in our questionnaires, the answers gave the following order of priority: slum clearance, renewal of blighted areas, upgrading substandard houses, downtown remodeling, new public buildings, solving traffic problems, and house preservation.

If we try to understand the criteria for these specific goals – why, for example, upgrading substandard houses comes third, or why traffic problems have a lesser priority than slum clearance – we cannot get any specific reply; and much less, if we try to understand the ratings of traffic problems and blighted areas, each of which contributes to the other. Thus, while many LPA's have set goals and priorities, there seem to be no rules by which such goals and such priorities can be rationally justified.

Policies and programs

Since it is clear that we have not set specific goals based on proper conceptions, and proper methods of estimating our needs, it is natural that we cannot speak of definite urban renewal policies and programs. In our context we only mean such policies and programs as are based on very specific rules and as are leading to completely justified and comparable results.

When we asked in our questionnaire, for example, if an analysis had been made of the over-all problems that are making the urban renewal projects necessary, 68 percent replied that such analysis had been made, 59 percent that specific criteria had been set in advance, and 61 percent that specific proposals had been suggested. It is characteristic, however, that only in 25 percent of the cases had a budget been prepared of the required expenditures for these programs. This, alone, is proof that many of the programs are still very general and cannot be considered satisfactory. Any program that does not lead to a specific budget, related to the total financial potential of the city, is certainly not a program satisfactory enough to commit the city and the nation.

We might also note that 55 percent of the replies stated that the evolution of the present problems had been studied, and 42 percent that the expected evolution of anticipated new problems had been studied. And 28 percent said that predetermined criteria had been set defining the manner of studying the evolution of present and the creation of new problems. In 43 percent of the cases, a study of the problems of the future had been carried out; and in 24 percent, there is a statement that specific proposals for their solution have been made. Again, it is characteristic that only in 11 percent of the cases has a budget been worked out.

I think that we are entitled to conclude that only the 11 percent of the LPA's that have prepared budgets for the future come close to the notion of a long-term program; and from the few budgets that we could study it is clear that they do not anticipate major changes within the larger urban area, although such changes may occur and they would have a very great impact on the urban renewal projects.

Even if it is assumed that 11 percent of the programs are completely satisfactory, we learn from the replies that only 4 percent have had approval of the total allocation of funds necessary for implementation.

Thus, we are led to the conclusion that, because of the lack of specific goals, urban renewal as a whole has not developed a specific methodology for the formulation of policies and programs.

There can be no commonly accepted policies and programs until specific goals for the programs are set and until a specific method has been agreed upon for the proper estimate of the total size of the problem. Only then can the size of the problem be interrelated with the financial potential of the community that is to undertake the program and with the results to be expected from the implementation of the program. The Community Renewal Programs (CRP's) are tending to develop such programs for wider areas. They have not yet led, however, to the formulation of commonly accepted policies and programs.

Implementation

Looking around at the hundreds of urban renewal programs that have been implemented, we discover great variety in the methods followed to achieve the goals set. Because of the lack of general goals, every authority has in practice set its own goals – with emphasis on slum clearance, or downtown remodeling, or preservation of houses, or the solution of traffic problems, or whatever. What is more, every LPA has followed its own road toward the achievement of its goals, whether in the development of policies and programs or in the methodology of implementing projects, from the selection of the sponsor to the selection of a plan, of a design, and so on.

The fact that so many different methods have been followed for the implementation of the urban renewal effort has by now given us much valuable experience, but it has not yet led to the development of a methodology that can help everybody concerned to select his own road in a systematic way.

The difficulties that have occurred during the phase of implementation are due not only to the lack of a specific methodology, but also to the fact that LPA's have limited responsibility. The fact that LPA's in many cases have no responsibility for planning, often are limited in operations to only one part of the physical settlement, and often also are separated from the responsibility for housing, enormously limits the possibility of a proper implementation of their programs.

There are several hundreds of LPA's struggling toward the conception and implementation of urban renewal efforts. Some of these efforts are very important, some not at all. This is a valid situation in view of the size of the total effort and the methods that have been followed and the experience that has been gained from the many individual efforts.

Irrespective, however, of the degree of success and the degree of experience gained in individual projects, we can state that, on the whole, LPA's are following a rather random course. In this way they may solve partial problems, but they will certainly never solve the over-all problem of urban renewal. LPA's may – and I want to lay emphasis on "may" – in this way solve their problems for today but they certainly cannot solve them for tomorrow.

It may be interesting to refer to the replies given to some questions related to the overall urban renewal effort. When asked if during the study of urban renewal projects it was found necessary to modify the areas surrounding them, over

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half (53 percent) stated that it was not, and 44 percent stated that even after the implementation of projects there was no such need. However, 8 percent conceded that modifications were necessary although they had not been foreseen.

On the other hand, when we asked if the urban renewal projects affected neighboring areas, 63 percent replied "yes," and only 6 percent contended that the projects have no such influence.

Although only a short period of time had elapsed since urban renewal projects had begun to be implemented, it was generally conceded that little improvement had as yet been noticed. If we add those who did not give any answer to the question whether urban renewal projects affected neighboring areas (39 percent), then we can see that nearly half (some 43 percent) of those who replied did not feel able to answer "yes" to this question. When we consider that these were responses of people who had conceived and carried out the projects, we feel justified in stating that we can already find signs of dissatisfaction among those most closely concerned with renewal projects.

If we do not know the total size of the urban renewal problem, how can we be certain that the policies we are conceiving, the programs we are preparing, and the projects we are carrying out are, in fact, solving any part of our problem? How can we be certain that, in spite of our efforts, we shall not be worse off tomorrow than today? If we have no specific goal, and no specific system for estimating needs and programs, we cannot be certain that in cutting down trees to make a road we do not cut in the wrong direction – and instead of finding ourselves in open country, in fact penetrate deeper into the forest.

Conclusions

I think we may now draw the following conclusions[5]:

Urban renewal has had a slow start. This slowness is justifiable, since it is the beginning of a new effort in which man has no experience at all; but it has, unfortunately, resulted in disappointment for most of the people concerned.

Urban renewal has not followed a program conceived in a systematic, detailed way, so its problems cannot be accurately assessed and it cannot yet travel a well-defined road.

The relatively few projects that have been started have not yet led to any convincing results about the impact of such efforts on the future of our urban areas.

There are no signs that the period of continuous dynamic changes in U.S. cities is concluded. On the contrary, we must expect, in some cases at least, even more dynamic changes.

Urban renewal problems in the United States

Planned and unplanned urban renewal

Because our era is beset with so many problems and so many difficulties, there is a strong tendency of concentrating on a specific problem and trying to solve it. We can solve the specific problem on which we want to concentrate only if we first see it as a part of the total situation to which it belongs. For example, we cannot limit our research into the causes of cancer to the study of the cells suffering from cancer. We can be successful in our research only if we understand the impact of cancer on the human body as a whole, and then concentrate on the affected tissues. In the same way we have to try to look at our problem of urban renewal in the

broadest possible frame. This means that we have first of all to expand our problem in time, in space, and in content, and only later turn to the specific problem with which we are concerned in this study.

It is wrong to think of urban renewal as a problem only of our times and of the great cities that have developed during the industrial era. Urban renewal is the age-old process of replacing the buildings, houses, and facilities that have outlived their usefulness. It is the age-old process that enables us to have cities today that have existed for centuries, sometimes even for thousands of years.

Urban renewal started in a very natural way. In every human settlement, whether village or city, everybody who could, rebuilt his own house or shop on his own plot when these buildings had passed their period of usefulness. This can be called the "natural" process of urban renewal.

In the same way the city as a corporate body rebuilds roads, sewers, and water lines, and sometimes even remodels or relocates roads and public squares better to serve its new requirements. It does these things as a matter of normal evolution, often related to the "natural" renewal of private properties.

In these circumstances, urban renewal can be said to take place in a natural way and the city needs only to have an administration fully aware of renewal needs. Such a city administration exploits every possible opening presented by the natural renewal of private properties to rearrange the public areas and facilities of the city to better advantage.

Although much urban renewal has taken place in this natural way, sometimes it does not, and then urban renewal becomes a public responsibility.

Historically, public urban renewal has usually taken the form of developing new areas outside the cities, rather than reconstructing obsolescent areas within them. This was practically always the case when a new group with higher living standards took over a city. The new group created new patterns of living extending the city instead of struggling to ameliorate and renew the old areas. Colonizing powers offer some examples, as the Roman expansions of cities and the building of British cantonments in India and Pakistan.

If the urban expansion was extensive, the new areas might attract residents from the old areas that were ripe for renewal. These old areas would then be relieved of pressures, values of land would fall, and it might be practicable to renew them through demolition and rebuilding. If, however, the expansion was not extensive enough to accommodate the new residents and also attract enough inhabitants of the obsolescent areas, this rebuilding would not take place and the city would merely expand, without the expansion involving any renewal of the old areas.

In a small number of cases in the past, urban renewal has been accomplished by demolition and complete reconstruction of the unsatisfactory urban developments by the city authorities. Such action has occurred especially in relation to the unhealthy parts of cities following major epidemics, but such cases are very few. Most such urban renewal projects were carried through in a compulsory, even savage, way. Perhaps the most drastic example was the destruction of Rome by Nero, who might be called the first urban renewal director of the school that believes in renewal through destruction!

The need for planned urban renewal

Much urban renewal still takes place in a natural way, but there are many cases in which natural urban renewal cannot keep up with needs, because rapid economic and technological developments have resulted in faster changes in

patterns of living, with corresponding requirements for buildings and facilities, than ever in the past. Thus we are forced to begin to think of renewal as a public responsibility.

Comparing present and past needs for planned urban development, we can state that:

- now is the first time in history that planned urban renewal has become of major importance; and,
- there have been few instances of planned urban renewal in the past and they have been in cities of extraordinary size or importance at certain periods, as, for example, Rome, Constantinople, and Paris.

Thus, we may say that we are entering a new era of planned urban renewal, with almost no experience and without being prepared for it. We can state with certainty that the problem of urban renewal has not only become extremely serious in our time, but that it is a problem that is apparent practically everywhere in every country. It occurs in every major city irrespective of its nature, and in many minor cities.

Not only is the problem of urban renewal gigantic, but people generally have not yet become conscious of its importance. It is discussed today only in the countries where the problem is very acute, and the urban problem of only a few countries has evolved to the critical stage it has reached in the United States.

However, it is of the greatest importance that the problem of urban renewal be understood not only when it reaches a critical phase, when the need for a solution is so urgent as to be unavoidable, but as a problem that must be faced even when it is small. Public health measures must be taken not only during periods of epidemics but also in normal times to avoid the onset of epidemics.

The U.S. pioneering effort

The United States in its urban renewal effort has started an historical process of the greatest importance for all countries. In pioneering this road, it must inevitably pay a high price for its experimentation. It also has a heavy responsibility to proceed carefully in the exploration of new approaches.

We must not forget that, though most urban renewal continues to be carried out in a natural way, this method is no longer adequate in various urban areas within many American cities. There are two reasons why public planned urban renewal has become not only necessary but indispensable. First, many urban areas have outlived the period of their usefulness, and, second, their owners and inhabitants have not had the ability and the money to rebuild the areas so that they will be useful to them and to the city.

Why have such areas outlived the period of their usefulness? We can offer three reasons:

- the age and/or construction of their buildings;
- the unsuitable location of buildings that, even if they are still usable, has made them lose their importance; and,
- changes in the structure of the area of the city in which buildings are located, involving changes in type of inhabitants, changes in use of buildings, mixed uses, and so on, resulting from rapid urbanization that has not been properly controlled.

Our survey brought out several overlapping reasons why the private owners and the inhabitants of such areas do not have the ability and the potential to rebuild them: 70 percent of the persons who answered believe an important factor is the great number of landowners, 36 percent that this inability is largely due to changes in the area's functions, and 35 percent that it is largely due to changes in population densities.

My personal conclusion is that there are two essential causes. The first, and more important, is the changing structure of the city. This may require:

- a change to a different land use, as when a residential area turns into a commercial area; and,
- a change to a related land use, but with different population densities or patterns, as when a residential area with single-family houses may have to be converted to multistory apartment blocks provided with parking lots, garages, and the like.

Thus, changes in economic conditions may result in problems of land use that are beyond the abilities of the individual inhabitants to meet.

The second major cause is when a whole area becomes ripe for demolition at the same time. This happens when a whole area was built at the same time, often by a single developer, and was sold to many people. Although the initiative for its development came from one source, the initiative for its renewal is now awaited from many. In such cases it is difficult for individuals to initiate renewal, since they are not confident that others will follow their lead.

These problems are intensified when the area that needs to be renewed is large. The cases in which one developer has taken the responsibility of buying large areas and renewing them on a comprehensive plan, like the Rockefeller Center in New York and some other large developments in other American cities, are too few and too small in relation to total needs to allow us to expect this system to operate everywhere without any governmental policy to make it more feasible.

Unplanned versus Planned urban renewal

When a city has buildings that are no longer useful in their present form, but their owners are able to rebuild them, no problem arises. It is only when the buildings are not useful and the owners are unable to rebuild, that we have major problems. There are also some cases of useful buildings whose owners are able to rebuild them, but that may have to be demolished because they happen to be within areas that have to be remodeled completely.

If we look into the causes of nonusefulness, we find that buildings may have become nonuseful because of age or location. Where buildings have become nonuseful because of location, or because of age and location, changes in the structure of the city enter in two ways: they have influenced the location and thus made the buildings non-useful, and they have also caused the owners to become unable to undertake the necessary renewal.

There is no question but that owners are more easily able to undertake renewal of their properties when a whole area undergoes a normal renewal and when any owner in it may follow the general trend if he can finance the renewal of his own property. If he cannot, he sells his property to somebody who can and who then undertakes the renewal effort in a natural way.

However, unless the whole area is experiencing such an upgrading, a single owner, or a small group of property owners financially able to undertake renewal, cannot be expected to make the effort to build better buildings. For if everything around them is nonuseful and dilapidated, the better buildings that they might construct will not change the structure of the area and will not yield a satisfactory return.

When owners are financially unable to undertake renewal themselves, they normally resist public renewal, as they know they will not be able to own the new buildings. This is particularly true in slum areas, especially when the buildings are already amortized, because low maintenance costs allow high profits from rents.

The conclusion is that there is a need for planned urban renewal, that this need is natural at this stage of development of American cities, and that the renewal must be undertaken by the community, since private individuals are seldom able to undertake it for large areas.

The Problem of TURA

In order to understand the urban renewal problem as a whole, which 3. is an indispensable preliminary to the study of methods by which we can tackle it, we turn to TURA. TURA (the Typical Urban Renewal Area) was created, as already mentioned, as a case study. In order to create it, we had to study many American cities and their evolution

during the last century or so. As a result of this study, we present the typical Urban Renewal Area of TURA, whose development over a 120-year period is shown in figure 1.

TURA emerged as a settlement of some importance in the beginning of the nineteenth century on the banks of a river. It was a small city with a few outlying settlements, most of which were groups of private farms. At this stage, TURA was not necessarily based on a gridiron system; but as it expanded, it assumed this pattern.

At present, TURA has within its total urban area a population of about 1,000,000 people – 50 percent living in the central city and the other 50 percent outside the central city but in the metropolitan area. These figures are an approxi-
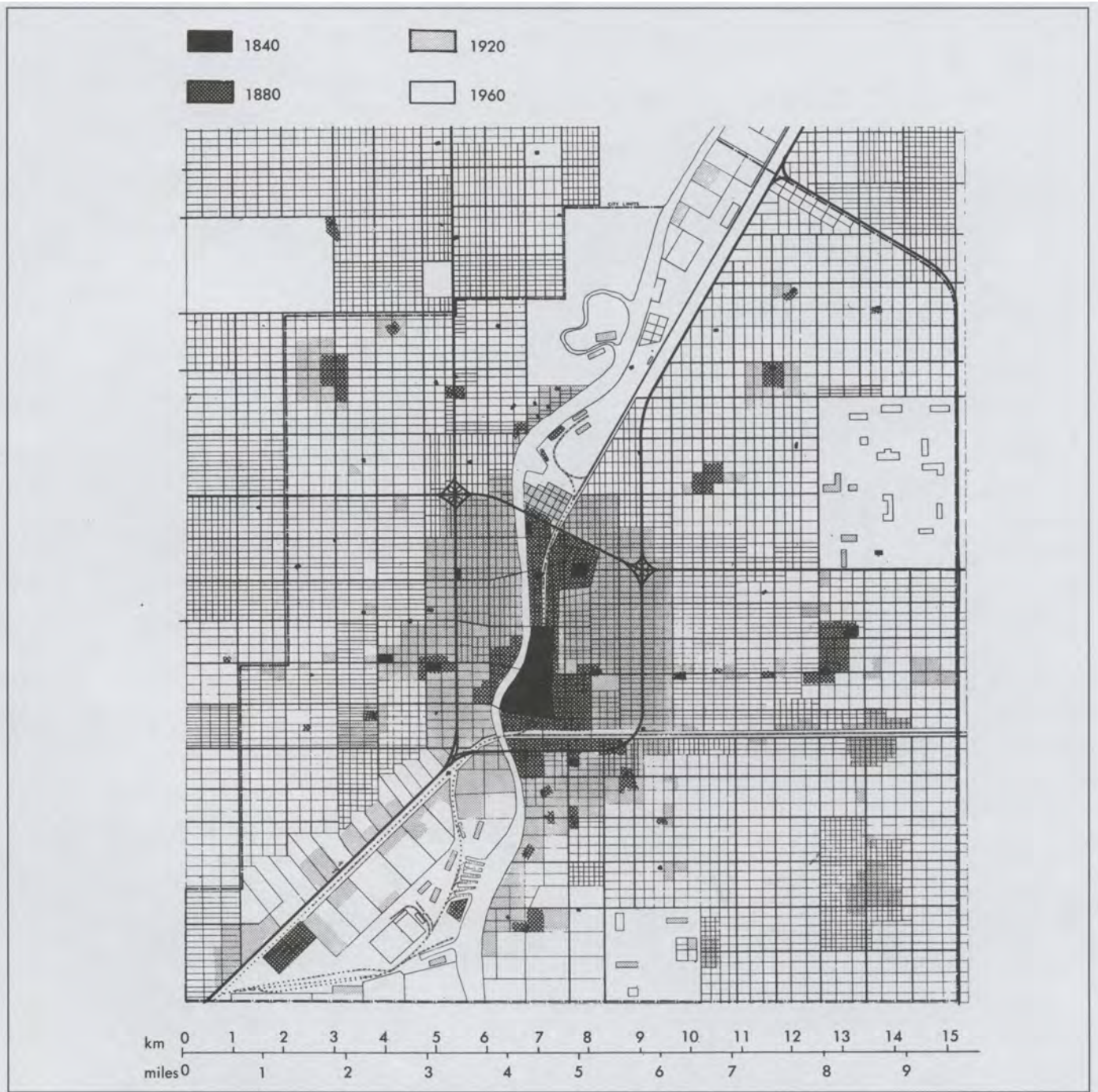
Fig. 1: TURA City.

mate average of the population of U.S. metropolitan areas. This average was computed on the basis that the population of U.S. metropolitan areas with a population over 1,000,000 is 61,600,000. Metropolitan areas with a population below 1,000,000 have a population of 51,300,000. Thus the total population of U.S. metropolitan areas is 112,900,000. Of this 112,900,000, the main central cities have 58,000,000 and the suburbs 54,900,000.

In 1840, the city of TURA was only a very small part of the area it now encompasses. Around it were some very small villages and a few farms that covered an extended area. How small the city of TURA was in 1840 in relation to its present-day development may be seen in figure 1. The expansion of its center along the river, which was the main factor in its development, is shown in figure 2.

By 1880, the construction of railway connections had resulted in a greatly elongated TURA City, as well as the development of several other settlements, mainly along the railway lines. The main city had become connected with the village north of it and had spread to the western side of the river.
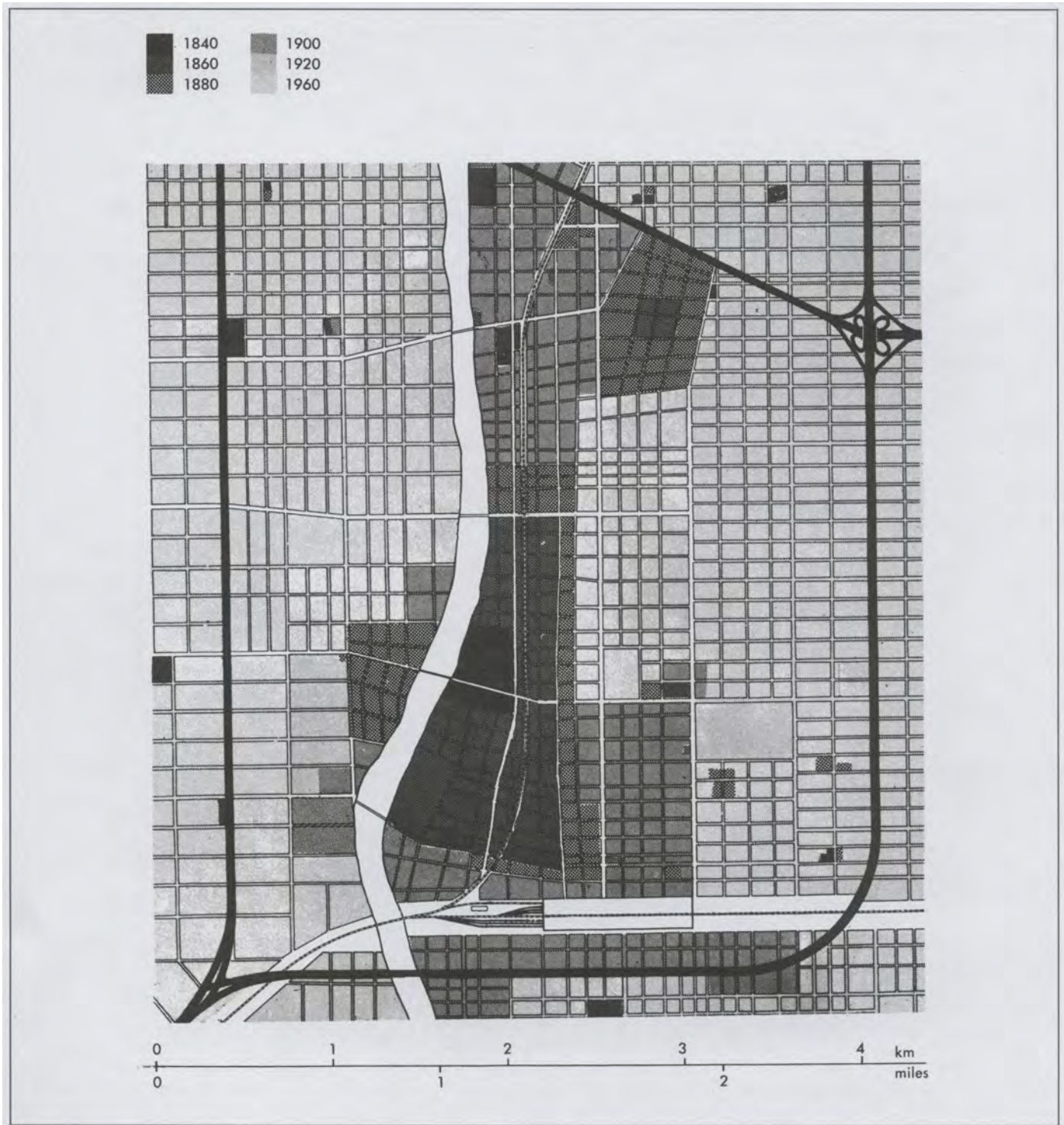
Fig. 2: TURA Center.

By 1920, the influence of cars on TURA City is apparent. The city has grown greatly and, as cars can drive in all directions, its shape is tending to become round. The elongated form that developed along the river and the railway has been superseded by a form that is much closer to a circle or a square, with rays spreading in different directions along the river, railways, and highways.

By 1960, the number of roads and highways has greatly increased. The gaps between early radial expansions are filled. The trends toward more transportation routes and denser population are continuing, and, in addition, we witness the first major surgery in TURA City in the form of major highways that cut through the urban body. The administrative area of TURA has now been completely built up and the city has expanded out into the countryside. While TURA City was growing, so were its problems, particularly in its central area. Many parts of this area have become slums, and the whole area suffers from traffic congestion. Citizens generally are dissatisfied with the conditions within TURA, but the city cannot raise the capital for complete renewal of its center.

Apparent and underlying causes of the need for urban renewal

The United States is facing problems calling for planned urban renewal on a greater scale than any other nation, and since they are occurring for the first time in history, it has not yet been able to develop the proper conception, policy, program, and methodology to meet them. Thus, it is impossible to estimate systematically the exact size of the urban renewal problem or its real relationship to the financial potential of the country.

Therefore, while the main apparent cause of our problem is the changing structure of the city itself, as we have seen in TURA, the situation is aggravated by our inability, first, to estimate the exact dimensions of the problem and, second, to develop a systematic program to deal with it.

The National Housing Conference, at its annual meeting, March 12, 1961, in a statement titled "A New Program for Housing and Community Development," adopted by its members, said: "It is conservatively estimated that more than two million new dwellings a year are needed to keep up with population growth and other current needs and for the replacement of substandard dwellings. Yet from a post-war peak of 1,400,000 dwellings in 1950, home building has in the first quarter of this year dropped to a rate of only 1,000,000 dwellings a year." Thus, it is quite clear that, despite the overall effort, the urban renewal problem in the United States is growing, and that through failure to provide the enormous number of new buildings indispensable to the normal functioning of communities, resulting from the changing structure of its cities, the situation is continuously deteriorating.

Looking at this problem in a different way, we reach a similar conclusion. According to the 1959 annual report of Housing and Home Finance Agency, "... between 1950 and 1956 the number of dilapidated units was reduced by 250,000 to 300,000, yet the total number of such units in 1956 was still over 4 million. At this rate it would take about 90-108 years to eliminate all of them."

This official statement shows only an approximate picture of what we should expect, and it may be optimistic, as we have no evidence that the number of buildings that annually become dilapidated or obsolete will not increase enormously. If we take into consideration that the obsolescence of buildings is due not only to age but also to the changing structure of the city, and that structural changes in cities are going to increase enormously, we may reach the conclusion that, in spite of our efforts, it may take hundreds of years to eliminate the obsolete buildings.

Urban renewal today: A static approach

The current situation has brought me to a firm conclusion, which I cannot yet prove with figures, as this will require much more research and the mobilization of great resources. But no matter where I start or which method I follow, this whole study and all my findings lead me to the firm conclusion that in none of the many urban areas that I have visited and studied is the situation as a whole improving, despite the efforts made through urban renewal.

If we try to find the real underlying cause of the need for urban renewal, we reach the conclusion that every problem results from the constant deterioration of our urban way of life, which is a result of the changes occurring continuously within our urban areas.

The great advances in our technology have prevented us from realizing fully how great has been the deterioration in our way of living and in our urban areas. We are only now beginning to understand this deterioration as a major problem of our generation.

And because we are facing the problems of changes within our urban areas in a static way with urban renewal projects, we are aggravating our situation. We are trying to meet continuous, dynamically changing conditions with a static solution. Let me explain this statement.

There is no doubt that the situation within our cities is changing much more rapidly now than ever before. This is what we can call a dynamically changing situation with an increasing rate of change. On the other hand, urban renewal projects have been conceived for certain parts of the urban area – for a certain size of population and the corresponding economic, traffic, and other conditions. This is planning for a static situation, even if the urban renewal project has anticipated a reasonable increase of population, growth of income, increase of traffic, and so on. For this projection all leads up to a certain moment in time, let us say the changes anticipated in ten or twenty years, and it will not be satisfactory beyond that time limit. Thus, the urban renewal project is conceived to solve a certain, defined problem, whereas the problem is continuously changing.

If we take any part of our urban area and try to face its problems in a static manner, for example by re-establishing a green belt as conceived in the past, a few years will show that such a static design cannot save the city or even any part of its periphery. We have only to think of how it was twenty years back, or ten years back, and how it is today, to understand that it is unrealistic to expect the city to remain much as it is today ten or twenty years from now. As long as the city is dynamically changing and this dynamic change affects all its parts, as long as the dynamic change of every part means a changing structure, it is not possible for the resulting acute problems to be solved by means of static urban renewal projects.

Changes at the center and at the periphery

The changes in cities are of several kinds: changes in population density, in land use, in transportation, in the way of living of the various types of inhabitants, among others. These changes can occur anywhere in a city, in parts that have already changed greatly and in parts that have changed little over a long period.

If we study these changes, we will discover that they are due to the fact that during the last hundred years the city started growing in all dimensions, expanding in area and increasing its central locations in height to a degree unknown earlier.

Two dimensions:
The city of the past was static, typified by the fortified cities of the Old World. But in the nineteenth century the growing population broke through the walls and spilt over into the countryside.

Three dimensions:
The city expanded in height as well as in area

Four dimensions:
The new city has acquired a fourth dimension, time, whose role is often more important than the roles of the other three

Fig. 3: The city acquires new dimensions.

Up to the nineteenth century only three dimensions were important in the city: length, width, and height. But the population explosion made it essential to take into account a fourth dimension, time, and the role of this dimension is continuously increasing in importance (fig. 3).

In addition to the population explosion, another change occurred in the early part of the present century – the addition of a new inhabitant. The automobile invaded the urban areas and has since become a much more important inhabitant than man himself in size, in strength, and in speed. We only have to look at our cities – along a street, in a public square, or from the air – in order to observe the validity of this statement (fig. 4).

In the 20th century, the unit of magnitude, man, has been replaced in our cities by a new unit, the automobile, which covers a proportionately much larger space, moves at much higher speed, and brings its hard surface into conflict with the soft human body.
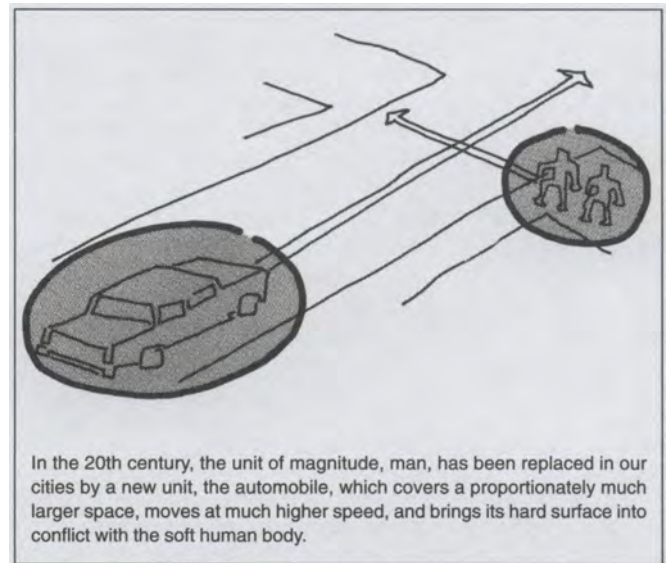
Fig. 4: The city is conquered by a new inhabitant.

The increase in population and in automobiles inevitably causes great changes in the center of the city, and the problem of the expansion of the center is complicated by the fact that it must take place within a built-up area. Thus, the pressure of the continuously expanding center gradually changes the structure of many residential areas around it.

These expansions appear to occur like waves, spreading from the center and gradually covering certain parts of the city and changing their structure completely. If we examine these changes microscopically, we will discover they appear not as concentric waves, but as a series of minor changes that occur in every area in many directions as a result of major developments taking place close by. Such a microscopic view shows that these changes do not occur in concentric circles but in spots (fig. 5); but when these spots are viewed macroscopically, they appear as concentric waves (fig. 6).

The city's center

A characteristic example of change in the center of the city is in the number of floors per building. We may have an area with buildings that average five or six stories; but then, because of growth of the city, many more functions are needed within the central area, and the easiest way to accommodate them is for the buildings to conquer the height dimension and build upward to 20 or 30 floors. This change does not happen from one day to the next, and it does not happen to all plots of a certain area, since this kind of change seldom

Fig. 5: Changes of urban structure – Microscopic view.

A residential area not far from the town center. A large market is built

Shops are built within the residential area as an extension of the market, with warehouses next to them. The first inhabitants move out

More inhabitants have moved out and new, lower-income groups are moving in. The original character of the area is entirely changed

Fig. 6: Changes of urban structure – Microscopic view.

Normal residential area not far from the town center. The residential area is changing as the central area expands

Changes are spreading as the central area continues to expand

Ultimately, the whole area is changed in greater or less degree

Early phase: highest-income group next to the business center (E)

Business spreads into the high-income area. The first slums appear as areas are taken over by the lowest-income groups (A)

The unplanned continuation of change means a continuing deterioration of several areas and a consequent ┃ncontrolled redistribution of social and economic groups

Fig. 7: Changes of urban structure – Changing pattern of income groups.

takes place on the basis of an over-all development plan. If we look at the area microscopically, we discover that certain parts, while still mainly built with few floors, have some new buildings with a much larger number of floors.

Many old cities have shown over a long period a comparatively regular distribution of income, from the highest at the center to the lowest at the periphery, but gradually different patterns begin to appear. For example, very low-income groups may move into the houses, previously inhabited by the highest-income groups, that were left as the business sector spread over high-income residential areas. Such a change will induce further changes in neighboring areas. If an area at the center is downgraded from being the residence of a high-income group to that of a very low-income group, it is a deteriorating area that may become completely depressed; and this depression will radiate into neighboring areas. Such downgrading will result in all kinds of changes in the pattern of distribution of professional, income, racial, and social groups within the city (fig. 7).

Another frequent result of change is the disappearance of many parks, particularly within urban areas. Recent estimates are that because of the interstate highway program alone, two million acres of parks will be covered by concrete. This is only one of many factors leading to the extinction of parks; among others is the construction of all types of public buildings, including schools and post offices, that are taking over large park areas in American cities.

The total free space for parks and gardens in most American cities is continuously decreasing, and we can ask ourselves what we mean by urban renewal when we deprive a city of such elements as parks and gardens, and the beautiful buildings of the past, all of which made it worth living in.

We have only to look at a map of such a city center as downtown Los Angeles to see that freeways, streets, and parking spaces cover two-thirds of the whole area; and they are increasing at a rate that may lead to its complete obliteration (fig. 8). In spite of these extensive systems of freeways, streets, and parking, we can now cross the central areas of most large cities in an automobile at an average speed of only six to eight miles an hour – an even slower speed than in a horse-drawn carriage at the beginning of the century. We

This map shows the extent to which the automobile has pre-empted the central city area of Los Angeles. Statistics also indicate that one third of all the land in the Los Angeles metropolitan area is devoted to vehicular transportation facilities.
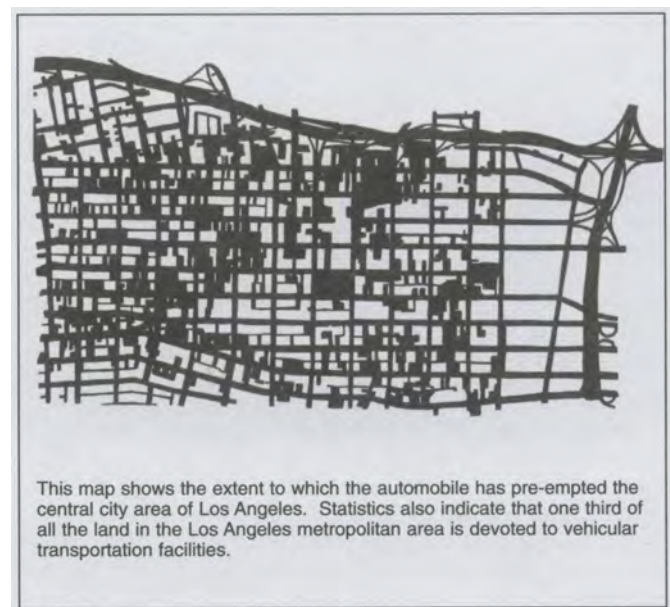
Fig. 8: Two thirds of downtown Los Angeles is devoted to freeways, streets, and parking.

9a: The oldest pattern. There is a single major city of moderate size in a relatively secure location.

9b: Transportation and economic developments have changed the pattern. New major cities have grown up and the old one has declined.

9c: The new major city has expanded and incorporated a number of the older settlements.
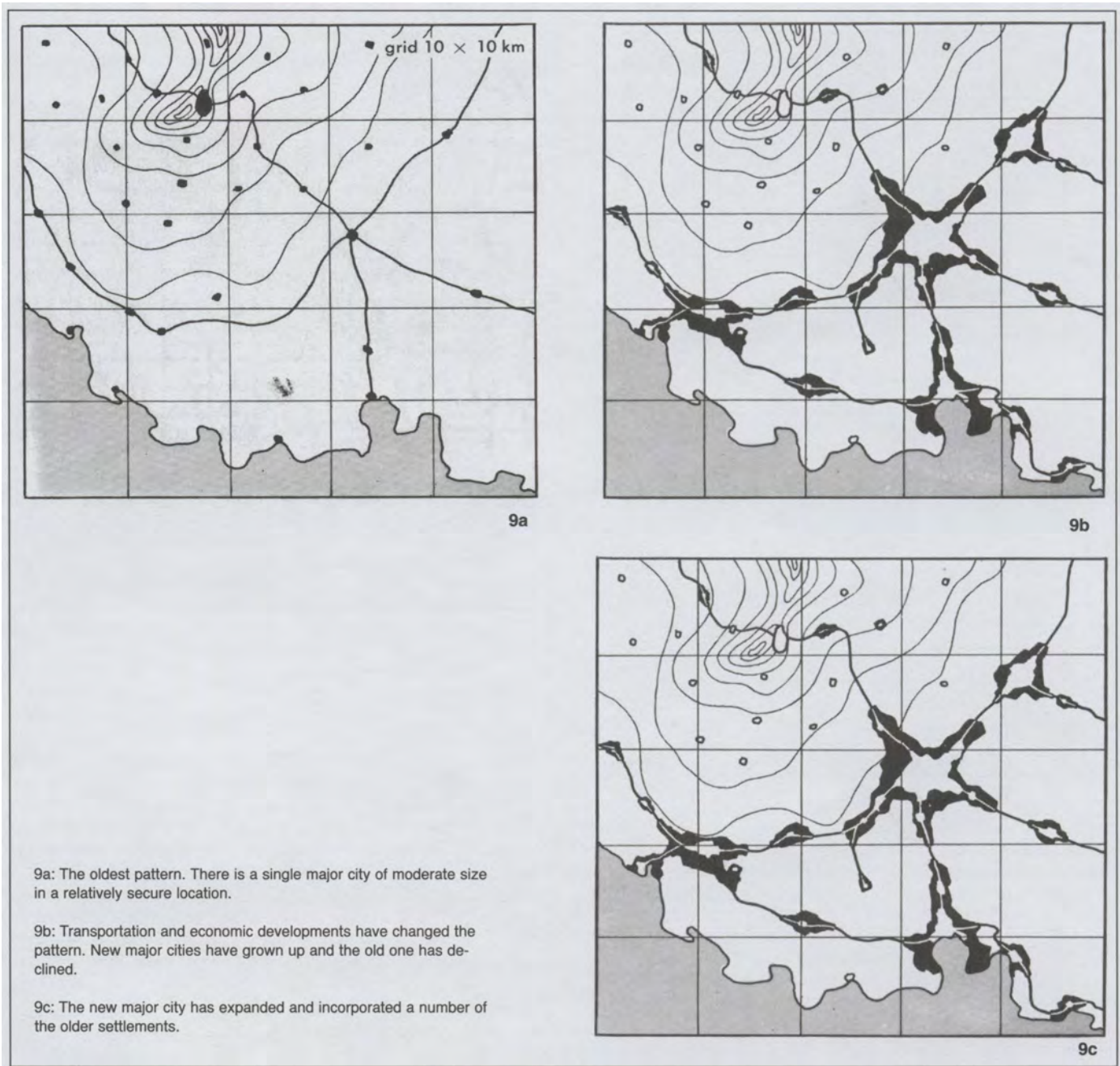
Fig. 9: Old and new regional patterns of settlements.

cannot imagine designing a building with lobbies, halls, and staircases but no rooms, yet we seem to work that way in developing the hearts of our cities.

The city's periphery

Changes occur not only in the central areas but also at the periphery, although the problems of renewal are not so immediately apparent at the periphery as at the center.

To understand the changes at the periphery, we have to look at the pattern and distribution of settlements over our countryside. In the pre-industrial era we had one important urban center and around it many minor centers scattered fairly densely close to it and less densely at greater distances.

With the development of transportation and industrialization the pattern changed. New centers were created at new transportation nodes and many more grew up around them in an even denser pattern. Old centers often declined as the new ones emerged. These declining centers have become depressed areas with renewal problems of a completely different nature from those downtown in the center city. Instead of having to incorporate additional functions, they are facing the loss of those they have, so a policy has to be developed either of reviving or of eliminating them.

Thus, as the new major city expands it incorporates different kinds of existing settlements. Within and around these settlements a new kind of urban renewal problem arises, for the new forces taking over these settlements exercise new types of pressures on them. Thus, on the periphery of the expanding new major city, existing settlements create problems because of great changes in their functions (fig. 9).

A chart of the growth of U.S. population as a whole and in
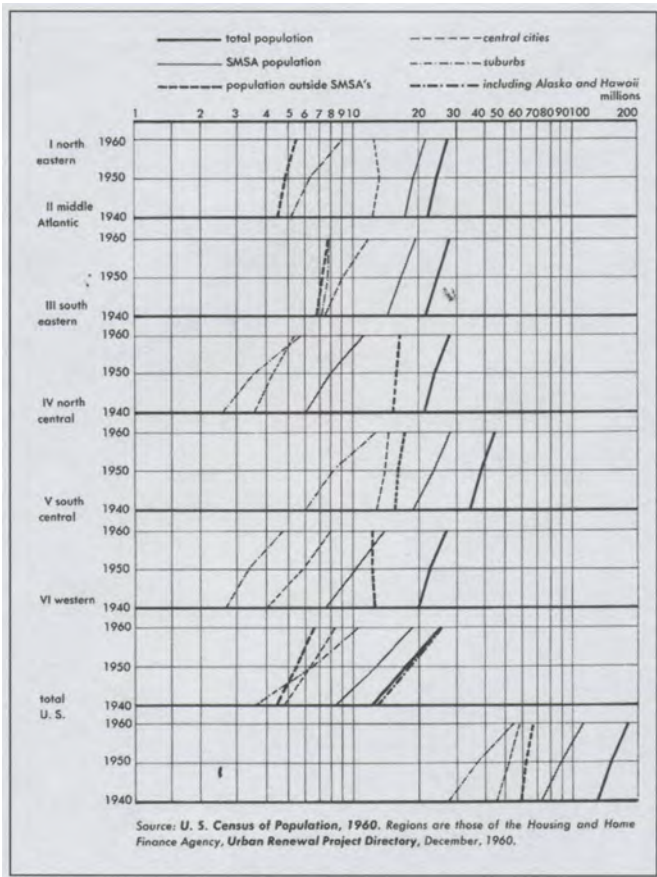
Fig. 10: U.S. population, by regions.

Fig. 11: Old pattern of regional distribution of settlements.

the several regions shows the importance of change in the periphery of cities (fig. 10). It is apparent that in the years 1940-60 the greatest growth in U.S. population occurred in the suburbs of the Standard Metropolitan Statistical Areas (SMSA's). Their central cities have grown less in resident population than the areas as a whole and, especially during the decade 1950-60, their growth has been scarcely more than the low rate of population growth outside the SMSA's.

It is also clear that:

• There are great pressures on the SMSA's, which can be expressed as pressures upon the center, and

• There are great changes in the periphery, where growth and expansion are such that other types of problems are created.

If we study these phenomena by regions, we find that the greatest growth has taken place in Region VI, the Far West, and in this region the suburbs show the highest rate of increase in the entire country.

In a schematic way we can think of the distribution of settlements in the United States in the period before the great changes as making a roughly hexagonal pattern, with several types of centers spread around the countryside. These centers were in a certain balance among themselves (fig. 11).

A new pattern emerges with population shifts (fig. 12). The regularity of the hexagonal pattern persists only in areas that have not yet been influenced by the great changes. Those areas that have experienced a great increase of population present other patterns of distribution of settlements. A comparison of populations still living in the old pattern and those living in the new shows clearly where we can expect problems of urban renewal: either in the center (suffering from many additional pressures) or in the periphery (incorporating and absorbing many preexisting settlements). We have only to consider how many minor settlements have been incorporated into the new pattern of major settlements to become aware of how many central and peripheral problems of urban renewal we have to be prepared to meet.

The importance of the phenomena presented in figure 12 can be realized if we look at figure 13, which shows all settlements of the previous phase plus the areas that become added to these settlements over an interval of time. What we want to illustrate is that any diagram that we present to show the current phase of our expanding urban areas is valid only for a certain period of time. After the lapse of some more time, the whole picture changes.

Development of the suburbs

As a result of further changes in population distribution, arising from the growth of new centers and of new means of communication, we witness at a later stage another big change – a great increase in urban-type population living in the so-called rural territories. There is thus created a new phase or kind of urban problems outside the periphery of existing urban centers.

This phenomenon has been especially intense in the northeastern part of the United States, as demonstrated by the studies of Jean Gottmann described in *Megalopolis; the Urbanized Northeastern Seaboard of the United States* (fig. 14).

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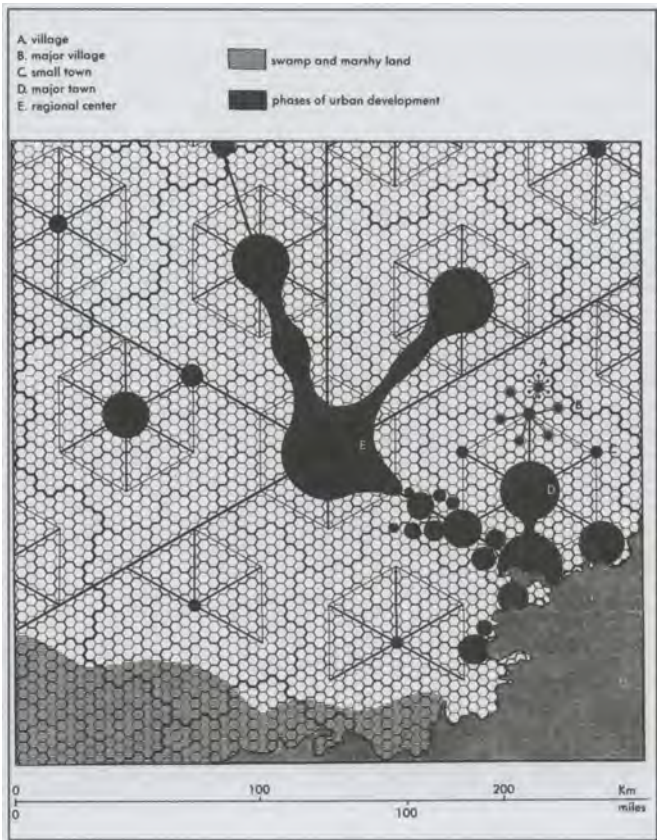
Fig. 12: New pattern of regional distribution of settlements.
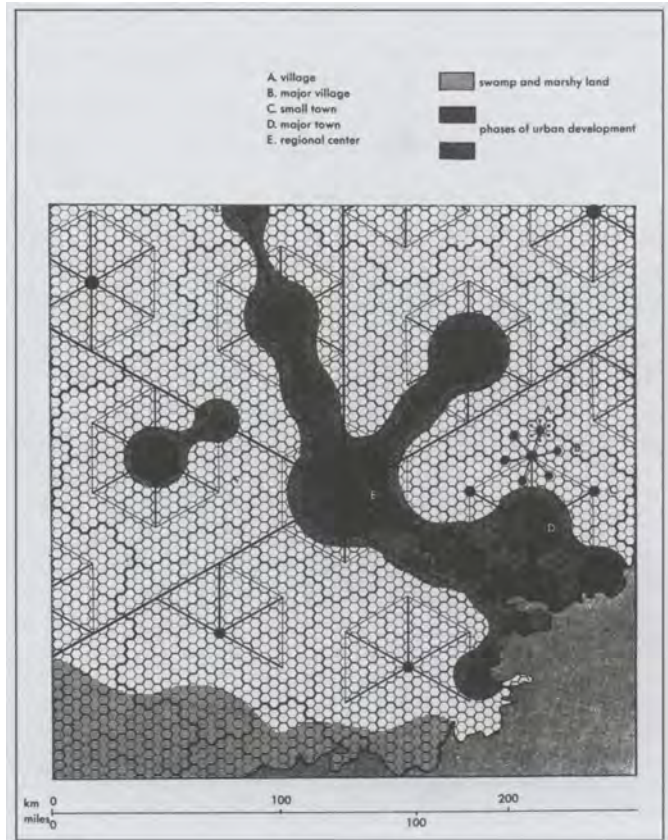
Fig. 13: Newer pattern of regional distribution of settlements – The pattern of the previous figure after a certain time (x).

A map showing the predominance of the nonrural element in so-called rural territories. The suburbanization of the Northeast is particularly striking. The size of counties and the desert somewhat confuse the picture in the West

Based on Jean Gottmann, *Megalopolis: The Urbanized Northeastern Seaboard of the United States* (New York: Twentieth Century Fund, 1961), Fig. 8.

Fig. 14: Suburbanization in the United States.
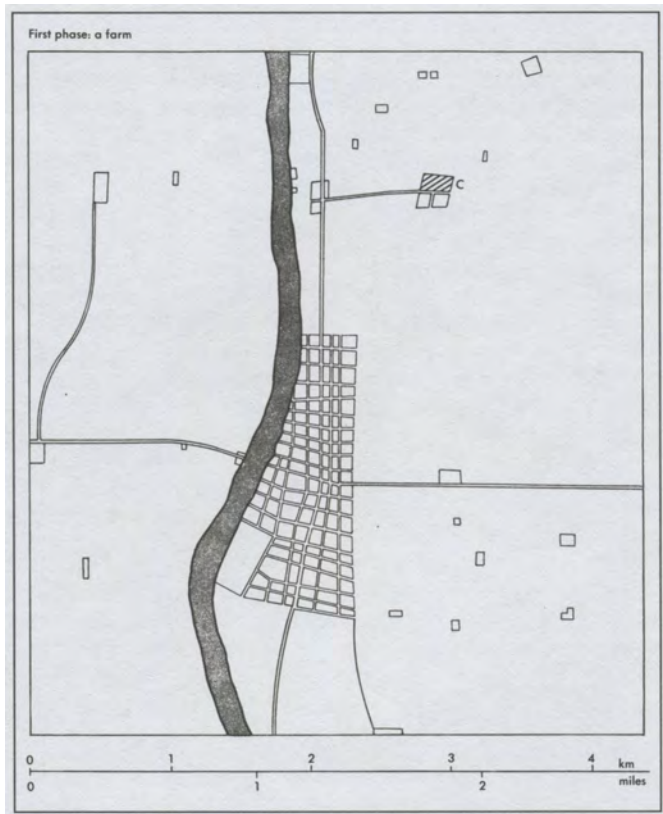
Fig. 15: The fate of a cell "C" 1840.
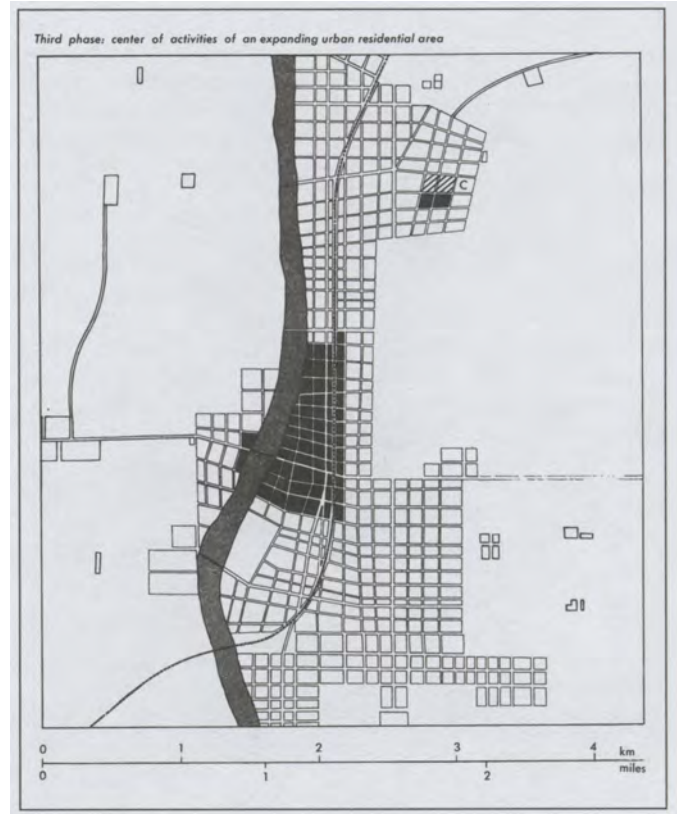
Fig. 16: The fate of a cell "C" 1880.
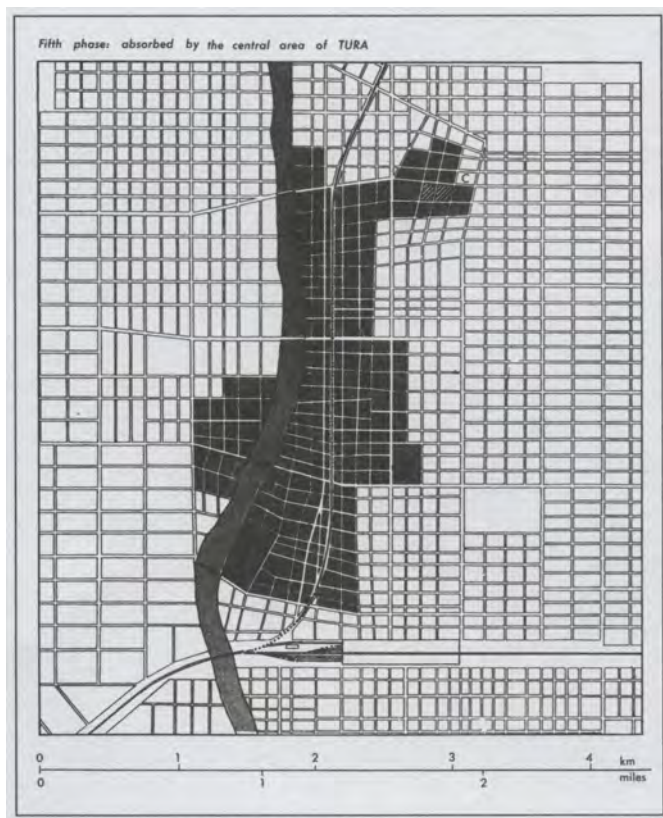
Fig. 17: The fate of a cell "C" 1920.
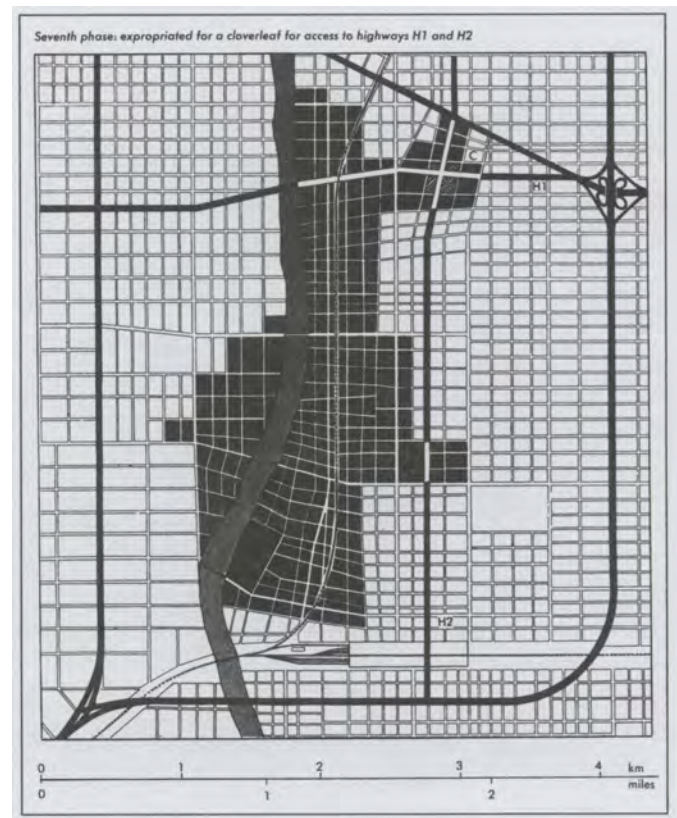
Fig. 18: The fate of a cell "C" 1960.

Urban renewal in an era of change

If we now think back to an urban renewal project conceived as a static element in the fabric of a city, whether at the center or on the periphery, we can see that it will be overtaken by the radiating waves of the changes taking place around it and will, itself, finally be compelled to change under the pressure of so many forces.

We have become accustomed to thinking that we are creating the fortress of the city of the future, consisting of many strongholds called urban renewal projects, but we discover that it is as impossible to defend this fortress as it was for the French in the Second World War to defend their nation with a static Maginot Line against the attacks of the dynamically conceived German army.

The great underlying cause of all urban renewal problems, and the reason our society has not faced them, is the constant change occurring within every part of our urban areas.

The fate of a cell

The fact that our settlements are changing continuously, in size and in nature, is forcing us to re-examine their problems both on a macroscopic scale, in reference to the whole body of the city, and on a microscopic scale, in reference to the changes that take place within every part of the city body. To demonstrate, we select one cell of an urban area, consisting of one normal city block, and we examine its evolution over the past 120 years.

The first phase of its life in this context begins in 1840, when our cell C is a farm next to a small rural settlement. This farm may have existed for many tens or even hundreds of years as a completely rural entity until the settlement grew up near to it; it was the building of this settlement that brought cell C into its first contact with urban life (fig. 15).

The small settlement begins to exercise an influence on the farm, bringing changes in its economy and in the social and political standing of its inhabitants. Twenty years later, the growth of settlements has turned cell C into part of a residential suburb. The small settlement of the previous phase grew because of its proximity to TURA and its location at the junction of a new road leading into a wider agricultural region.

By 1880, our small settlement is connected with TURA and is beginning to acquire the characteristics of an urban residential area (fig. 16).

Another twenty years and our cell has become part of the urban area of one of the outlying communities of TURA, but it is also beginning to experience pressures from the expanding central area of TURA. Previously, it had contained small shops to satisfy the needs of a minor area; but a demand has developed for workshops and small factories along the elongated center of TURA which follows the railway line, and our cell is deteriorating in competition with this more accessible central area.

By 1920, the expansion of TURA and its major center is such that cell C has been absorbed into this central area. As a result, it is now remodeling and recovering from its period of deterioration (fig. 17).

Yet another twenty years and a major highway H1 has been opened in the vicinity of cell C. This has given much greater importance to the area and has resulted in an increase in its property values and in its further development.

In 1960 the time has come for the opening of a new north-south highway, H2, and cell C is expropriated for the location of the clover-leaf providing access to the two highways (fig. 18).

1840-1960 – The evolution of a cell

Thus, the use and structure of cell C have been changed sev-

en times in 120 years, and each phase of its evolution has lasted only an average of twenty years. It is apparent that this evolution has been completely unreasonable; no change was ever completely realized and the new structures and developments were never completely amortized.

We can consider the effects of these changes on a city official who took over responsibilities in relation to TURA in 1920 and who prepared the first plans for the expansion of its center toward cell C as a young man. This same official, when he was a chief of section, in the 1940's, had to change these plans markedly in order to accommodate additional functions. And by 1960, just before retirement, he has had to see all the plans he prepared both as a young man and as a chief of section become completely obsolete.

This review of the evolution of a cell may convince us that the kind of changes that occur in it affect practically every other cell of the whole urban tissue. The cell we have looked at is typical; there are changes everywhere, though they are not always changes from farm use to residential, to central area, and then to highway use. In other cases the changes may be from one type of residential area to another, to an industrial area, to a new traffic line, and so on. And changes are not always on the positive side; they may create opportunities for development and, again, they may create conditions of deterioration.

If we present our whole urban pattern in a macroscopic way, changing in space by continuously covering larger areas, we must also consider that the tissue within this urban area is not expanding in a uniform way but is undergoing continuous change, like the waves of an ocean that do not leave any particle of water twice in the same position.

There is no cell of a city that is not influenced by the ebb and flow of the waves continuously moving through it.

From chaos to disaster

As with the ocean, the changing urban area has both continuous movement and continuous change. The waves do not move only in one direction, as if there was only one force blowing out of one center, as used to happen in the small cities of the past.

Now our urban areas are much more complicated. They have many centers and are undergoing many and continuous changes. A general picture of these changes can be shown by a model that we have constructed for this purpose – an electromagnetic model of TURA – in which, by varying electromagnetic fields, we have tried to show some of the changes within this area.

The electromagnetic models of TURA in 1920 and in 1945 (figs. 19 and 20), produced by changing the intensity of the electromagnetic fields, show many similarities to patterns of evolution we have discovered within an urban area. The changes in traffic alone, which have been studied in such cities as Chicago and Philadelphia, and the resulting models of actual traffic flows, although they are very useful for traffic problems, do not give the total picture of the problems raised by changes that occur within a city. What we try to do in these models is to show that it is not only along main transportation lines that we have great changes because of increasing traffic, but that, since changes in all the functions are occurring at a very high speed, they create not only much larger, but also much more complicated, problems – expressed in traffic of vehicles, in traffic of people, in communication among people, in volume of buildings, in problems of facilities, and in aesthetic problems, among others.

By the construction of such models we can introduce new methods of understanding more nearly exactly what is hap-
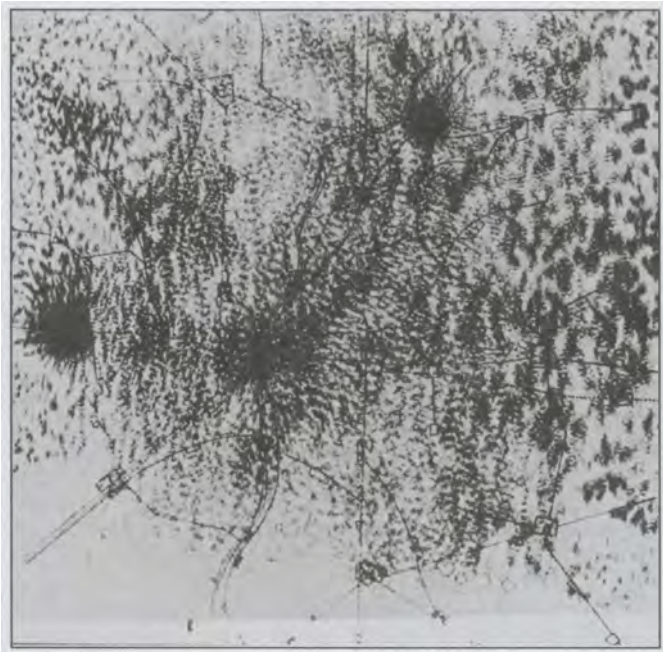
Fig. 19: TURA – Electromagnetic model 1920.

Fig. 20: TURA – Electromagnetic model 1945.

pening within urban areas undergoing continuous change.

At this stage we are entitled to describe the urban structure as chaotic, for the causes of every change are so many, work in so many directions, and at so many speeds that the whole structure is at present understood with great difficulty and is certainly not controlled in any way. By looking at these two pictures, or models, we can easily understand why we have avoided looking at the over-all problem in a systematic way: it is too complicated.

The need: A methodology

This chaotic situation shows the need for a methodology by which we can judge the changes taking place within our urban areas. Such methodology will demand some standards of measurement not only regarding existing conditions, but also regarding the degree of change and the degree of deterioration.

It is fairly obvious that such standards have not yet been developed. When asked about this, most of the NAHRO members (72 percent of those who replied) stated that standards exist for the classification of urban renewal areas. Rather more stated that they are able to define the areas requiring urban renewal on the basis of some standards. About the same number also stated that standards exist for houses and roads, but fewer thought there are standards for community facilities and other types of buildings. However, I have the impression that these answers refer to static standards, standards that mostly describe static situations.

The study of the chaotic structure of our urban areas may convince us that we need a different type of approach to these standards.

If we now consider for a moment that the situation of our urban areas is not improving, but that with every day that passes it is getting more and more complicated as a result of the great increase of population and the continuous and additional pressures that are exercised on our cities, both from the outside and the inside and from many points, we

can state with conviction that we are at present moving from chaos to disaster.

Life in certain parts of our cities is already difficult today, many parts of our cities are deteriorating, and we have every reason to believe that the process of deterioration is going to continue at an accelerated rate. More and more areas are going to become overcongested, more and more areas are going to be turned into slums – and at a higher rate of speed than at present.

If we cannot cope with the present situation, we shall be still less able to cope with the situation of the future. This increase of the problems, if combined with an inability to face them, is certainly going to lead to disaster.

Conclusions

Urban renewal problems have not suddenly arisen without any real cause. There are real causes for them and these causes continue to exist, and to multiply.

Our cities are continuously changing in size, in makeup, and in structure.

We are unable to face and to meet the increasing problems of our urban areas with the techniques that we have developed up to the present. We do not have any reason to believe that present approaches, present policies, and present programs can lead to the solution of our urban problems, in spite of the great efforts made by many people in the public sector (government) as well as in the private sector.

The chaotic structure that has developed around us presents a situation that is leading to disaster, and because of its complexity, it is creating confusion in our minds.

This confusion does not allow us to see the over-all picture of the problem. It binds us too much to present-day notions about remedies. It concentrates our attention too much on the idea of an individual project, a single city, or a single urban area, whereas we should be thinking about regions and the nation as a whole.

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C.A. Doxiadis' address at the University of Michigan Winter Commencement, where he received an honorary Doctorate of Law degree, 16 December, 1967. (*Source:* © Constantinos A. Doxiadis Archives of the Constantinos and Emma Doxiadis Foundation).

Confessions of a criminal

Introduction

When faced with the writing of an introductory paper for the subject of Buildings (Shells) and their relationship to human settlements, I realized that I was compelled to speak in my role as one of the criminals who are destroying the human city. [This document was the basis for the Research Discussions, after which it was re-issued in the present form, incorporating certain additions suggested during the discussions].

We are all committing architectural crimes; as criminals we have to make this confession first. Personally, I have been lucky because I learned to recognize these crimes from my youth. From my father and mother I learned what the word "human" means, and from my teacher, Pikionis, I learned what "human architecture" is. As a result I have made an effort not to commit architectural crimes, and to fight the criminals. However, the criminals *do* exist, and they are increasing in numbers at a very high rate. At the same time the severity of their crimes is also increasing. Since I live in the same world, in the same cities as all the criminals, I consider myself to be one of them and as such I hereby confess:

One: We are committing grave architectural crimes.
Two: We are not making an effort to stop. We are not even making an effort to confess.
Three: We do not acknowledge the causes of these crimes.
Four: We are not resisting their alarming rate of increase.

It is our obligation to define our crimes, to investigate their causes, to learn how to cope with the problems they represent, and to proceed in reversing our present criminal activities. This is what I will try to do here.

Our greatest crimes

We commit many architectural crimes with every day that passes, but this is an eternal phenomenon (Man makes mistakes in a certain percentage of everything he undertakes), and a natural one (we must learn by trial and error). This is not a new problem worth discussing now. The new one is that for the first time in our history we are making so many mistakes that they are developing from simple errors into crimes because those suffering from their consequences are no longer few (the inhabitants of a badly designed house) but

are many (the inhabitants of whole cities). Furthermore, the suffering of these people is no longer limited to a few months or years but will continue for generations to come.

The gravest of these crimes are the following:

● **First crime: The construction of high-rise buildings**

This is a very great crime because:

● Such buildings work against Nature by spoiling the scale of the landscape. The most successful cities of the past have been the ones where Man and his constructions were in a certain balance with Nature (ancient Athens, Florence, etc.) (fig. 1).
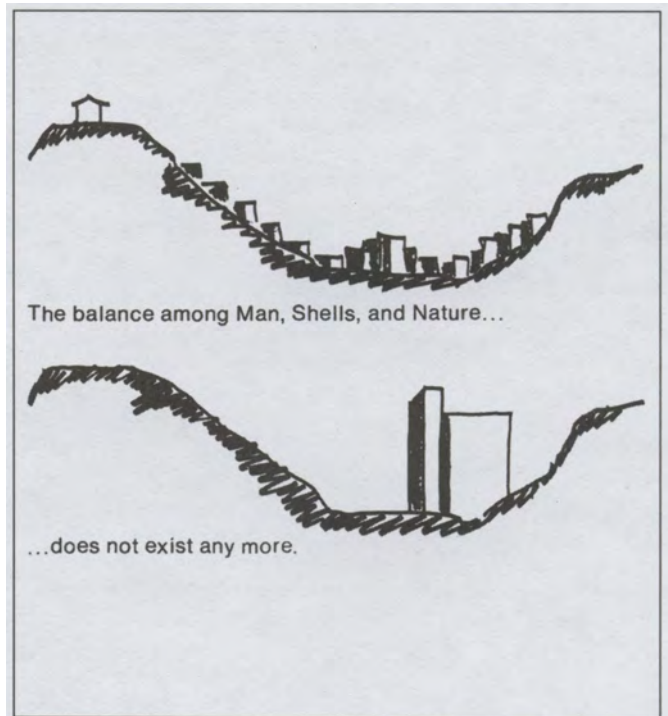
Fig. 1: First crime – first aspect: The high-rise buildings are spoiling the landscape.

● The high-rise buildings work against Man himself, especially against children who lose their direct contacts with Nature. Even in cases where the contact is maintained it is subject to parental control. As a result the children suffer and so do the parents.
● These buildings work against Society because they do not help the units of social importance – the family, the extended family, the neighborhood, etc. – to function as naturally and *as* normally as before.
● The high-rise buildings work against the Networks since

they increase the density, overload the roads, make servicing with water more difficult and expensive and, what is more important, create vertical Networks.

• The conclusion is that high-rise buildings work against the other four elements of human settlements and this is true also from the economic point of view (the city is overloaded with people and costs); from the social and political points of view (the few – the owners of this land – benefit against the interests of the many); and from the technological and cultural-aesthetic points of view.

Is it really the first incidence of this crime in history? Taken to such an enormous scale in terms of height and volume, it certainly *is* the first manifestation. At a much smaller scale, however, it often occurred in feudal times. When only one lord held the reigns of power, it was his tower which dominated the city, the tower of power and government which was later taken over by the people. Sometimes several less powerful feudal lords with conflicting interests erected their own towers, remains of which are still to be seen in the Mediterranean and the Caucasus as well as elsewhere. The fact that these symbols of rivalry neither became widespread nor managed to survive demonstrates the inhumanity of such phenomena. Nowhere in the world has a city ever developed successfully with such towers of rivalry.

In human cities property owners always had equal rights. Buildings rose to a certain height, varying from one story to four or five stories or even higher in some walled cities where greater density was necessary. This "normal" height was exceeded only by the edifices of the church or government or by fortresses, which were for the protection of all citizens. This is true both of ancient and medieval cities.

Why then, for the first time in history, have we become criminals in our cities? Because it is only in modern times that cities have experienced such rapid growth, are so vast, require so much space, and have an income and technology which permit any type of construction. Only now do cities have populations by far exceeding one million, which until AD 1800 was the limit. Only in our age are there so many cars that each citizen needs more and more space.

The causes of inflated land values and increased building heights are many. There is no valid reason why the few should profit at the expense of the majority. This exploitation of inevitable city growth is a result of:

One: Greed for economic gain.

Two: Ostentation and desire to achieve greater status, as is the case with many corporation towers.

The phenomenon really began in our century. When the Eiffel Tower was built in Paris in 1889, it reached a record height of 300 meters (984 feet) but it belonged to the nation. No individual was exploiting the city. Unfortunately, some great masters of the first half of our century like Le Corbusier in Europe and Frank Lloyd Wright in the USA put forward the high-rise as a solution to urban problems without taking a stand on the social and legal aspects of their proposals. As a result all towers now belong to private groups or very special services, even in socialist countries where land belongs to the state.

It is interesting to note that among the landownership battles I have witnessed in a professional capacity, one of the most severe was in a socialist country where the management of a steel factory opposed the interests of the city, represented by mayor and city council, and finally won their case. When I learned that land exploitation caused many problems in a touristic area of Poland, I was amazed, until I saw that even the character of Moscow's Red Square has been spoiled by some skyscrapers rising just beyond it. One could

understand the erection of a building above the old Kremlin of the Czars to present the new political system, but to spoil a historic square for the sake of a few buildings of secondary importance is a pity. The cases I have mentioned, however, confirm the two motives behind these crimes: even when people do not own the land, they still want to exploit the land they occupy and want to create a landmark. Man is no different, whatever the political system.

How are all these crimes occurring? Why do city and national governments yield to pressures for greater exploitation of some areas? Forty years of professional experience in 37 countries and on all five continents, and the study of many other countries and their problems, have taught me that in most cases landowners take the initiative. Governments agree either because they are not aware of the crime, or because they are under various pressures, which are usually based on statements made by so-called experts that skyscrapers are beneficial to the city. Finally, of course, in some cases there may be indirect and concealed financial interests which can lead to mafia-like exploitation of urban space. The fact is that no matter how educated and honest the city leaders, this phenomenon continues to spread.

We can therefore ask whether we should oppose such urban developments, particularly since we are aware that although high-rise buildings may not be acceptable for families with children, they may be quite suitable for offices, hotels, or other uses. The answer is the following:

One: Very often high-rise buildings are harmful to their own inhabitants. In this respect alone they are criminal and inhuman structures which should not be permitted.

Two: In other cases these buildings may serve their inhabitants but do harm to the city. In such instances it must be clearly stated why high-rise development of one property is preferable to renovation of many others. Frequently the erection of a high-rise causes many other buildings to become slums. So much new space is provided by one building that there is no incentive to renovate or rebuild other properties which fall into disrepair as a result.

Three: Even if the high-rise is considered the best solution for the city as a whole (this may happen in rare instances), we are still faced with one serious problem: why should only one property gain all the profit?

In concluding this section we can therefore make the following assertion: with the onset of the 20th century, humanity has entered a new feudal era in terms of urban land development; these practices are criminal and it is time to try and stop them.

People are beginning to react against high-rise buildings and the world-wide exploitation of urban land. This reaction takes many forms, from simple individual statements to very systematic and thoughtful attacks such as those of Lewis Mumford; from the simple expression of opinion found in folk songs of various countries to full scale legal battles.

Those who defend the crimes, or the criminals, depending on what we decide to call them, are beginning to counterattack on a so-called "scientific" or "cultural" basis. A typical example of their arguments is that we should not be concerned about mothers and children suffering in skyscraper housing schemes because Man is learning to adapt to new conditions. What these people forget to mention is what Man will be like when he has adapted to the inhuman conditions we have created.

In spite of these "intellectual" counterattacks against those who condemn skyscrapers, a realistic and systematic opposition to these crimes has begun. The most interesting examples that I know of in Europe are in Paris, where a fierce battle rages to save certain large areas, especially the area of

the Defense, the dynamic new center west of the present one in the Champs-Elysées area. In a recent official survey, 200 foreign personalities of international status were asked to express their opinions about Paris. One of their basic quarrels was with "the skyscrapers that are everywhere brutalizing its once matchless vistas." The same thing has already happened in London, where the disaster started much earlier. Now even city officials are admitting that "high-rise blocks were overdone." In the USA, a case in San Francisco seems to be the best stated and the most sucessful; a book, *The Ultimate Highrise,* gives valuable data on the whole situation. There are also other examples, for instance the battle for the Georgetown waterfront in Washington DC, but these do not involve the whole city as in the San Franscisco case.

This kind of opposition has not stopped urban crimes but people are at least beginning to become more aware of the situation and are ready to listen to proposals for action. Some reactions have been sufficiently positive to produce results which may solve some or even all of the problems, but are really only of local or partial significance.

● **Second crime: the dispersed buildings**

This is a very grave crime because if the dwellings are dispersed and find themselves at great distances from each other, the people cannot communicate easily and the community does not function properly. This is very dangerous and very inhuman (fig. 2).

I did not include this crime in my initial proposal because personally I classify it as a crime of the city structure and not of the buildings (shells) which is our subject; however, as

From continuous systems...

...we moved to discontinuous ones...

...and now we are even proposing complete dissolution.
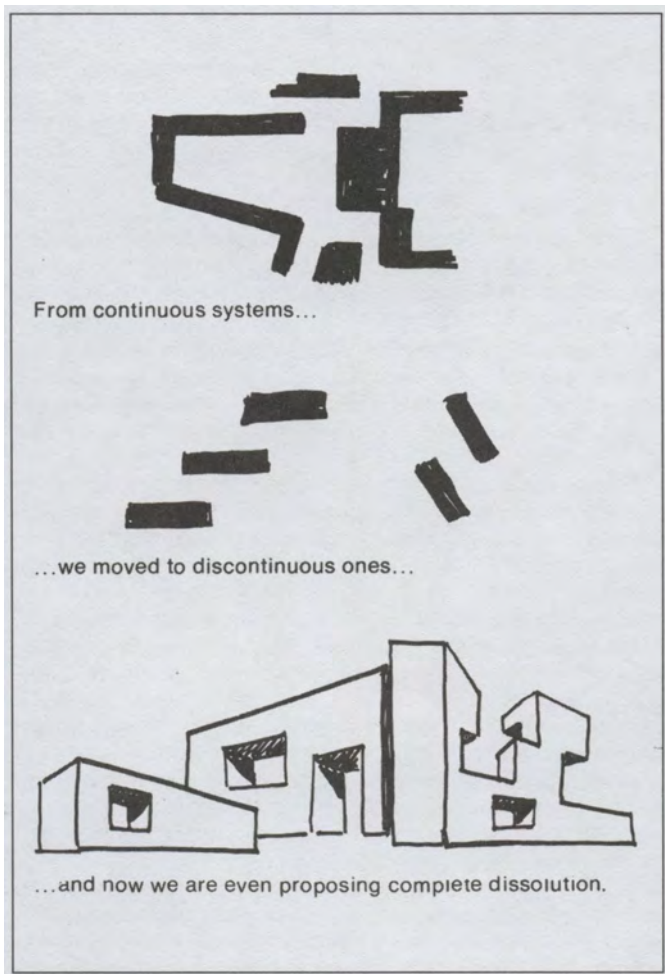
Fig. 2: Second crime: The unconnected buildings.

Whereas in the past there were few monuments and the city could function around them,...

...today large sections of the city are taken up by these fortresses
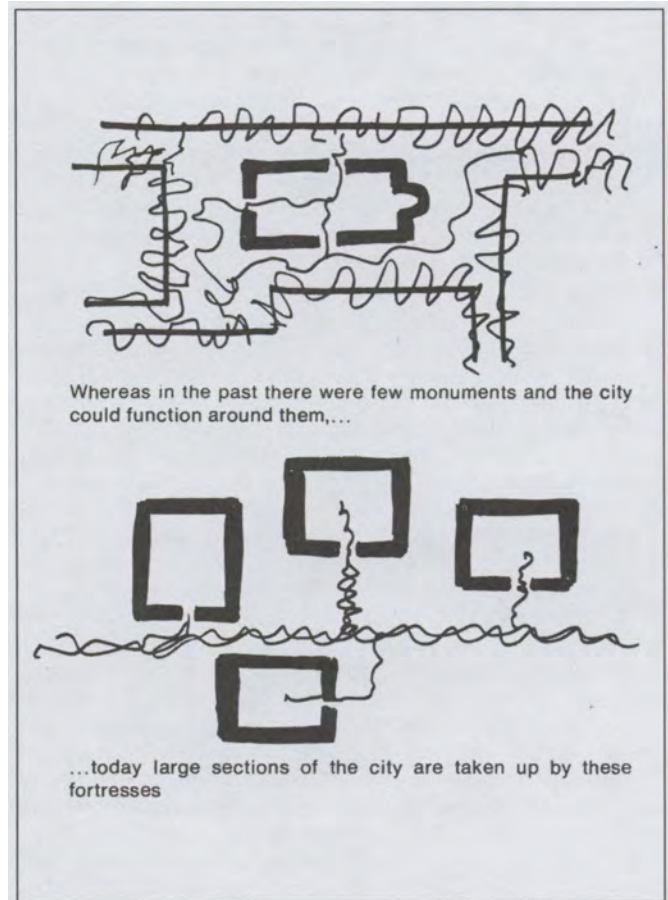
Fig. 3: Third crime: The monumental buildings.

many members of the research group thought that we should include it as the other extreme of the crime of the high-rise buildings, I had to agree.

The big question is: what is the density that is below the reasonable minimum?

● **Third crime: the unconnected buildings**

When primitive man built his first settlements, quite often the buildings were separate and unconnected (fig. 3). Gradually he became aware of the need to connect them into continuous systems, finally arriving at the successful formula (street, square) of the great cities of the past. Now once again we are breaking the continuity – first in the horizontal synthesis, and now recently, in the vertical. These buildings destroy the balance with Nature, and go against the interests of Man who needs a reasonable system within which to function, and against Society by not facilitating its operation, and against Networks by breaking their continuity. Consequently such buildings work against the economic, social and cultural-aesthetic interests of Man and his City.

● **Fourth crime: the monumental buildings**

No doubt we do need some monumental buildings, but are now trying to turn each skyscraper, each corporation headquarters into a monument – to whom or what I do not know (fig. 4). Their monumental character isolates these buildings from their natural and human environment and as a consequence the city itself becomes a discontinued system. This becomes more evident when we remember that these buildings close their doors at 5 p.m., thereby freezing life around them. But even during working hours these buildings do not function except as isolated forts.

Whereas in the past Man was in balance with buildings,...

today the city is out of scale and overrun by machines.
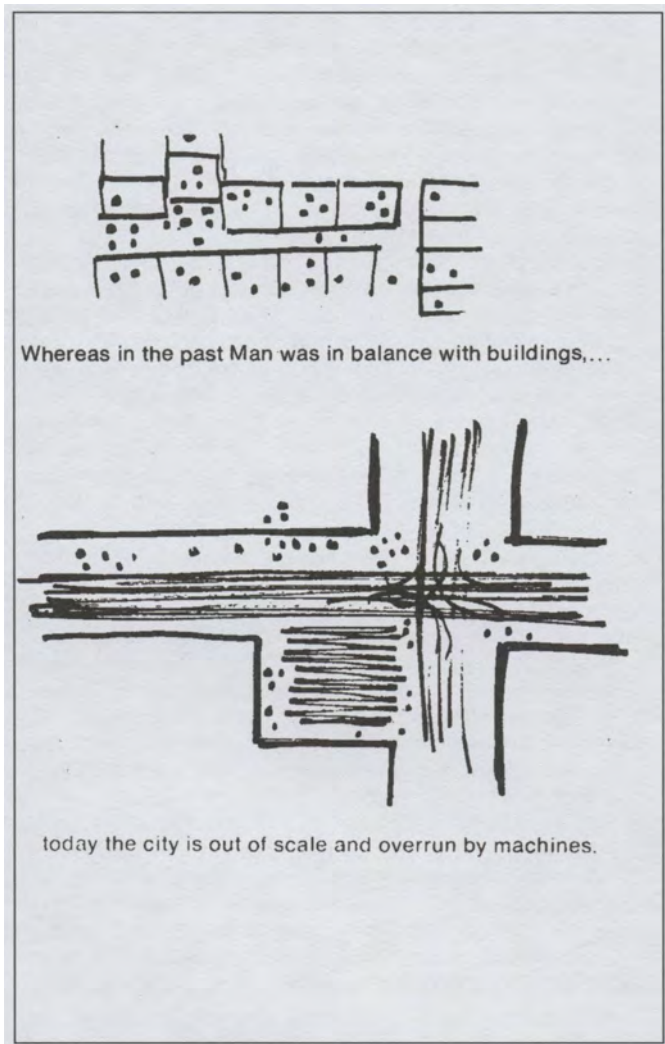
Fig. 4: Fourth crime: The loss of human scale.

● **Fifth crime: the loss of human scale**

As a result of the previous crimes, but also because we relinquished our control of the streets and squares to the machines – mostly to the automobile – the human scale has been lost in most parts of the city. We can first hear it in our apartment and then feel it much more in the street. This is harmful for Man (particularly the child), for Nature, for the functioning of our Society, and it does not facilitate the development of reasonable Networks. The city has lost its value.

● **Sixth crime: the anti-human city**

If we compound these four crimes and the numerous other ones we haven't mentioned, we will realize that the greatest crime of all is that we are constructing buildings which, both as single units and as systems, create a city working against the most important human interests: the balance of Man with Nature, of Society and its artifacts with the man-made environment.

The causes of the crimes

One crime at a time or a series of small crimes in one locality may be the result of normal causes, individual mistakes, or bad luck. This is not the case, now, for we have many great crimes occurring everywhere all the time. Some of their basic causes are now clear:

- *The first cause:* The huge increase of dimensions. City population has grown from 50,000 people, which it was for thousands of years; to hundreds of thousands three centuries ago; to millions one century ago; to over ten millions during the last generation. City population has increased over 200 times, but city income has increased over 10,000 times and its energy has increased even more. A similar situation was created for buildings. Where in the past one master could build one major building in one city in one lifetime, now many people have opportunities to create huge buildings. This change of dimensions for cities and buildings was unexpected and people were not prepared for it.

- *The second cause: the unbelievable increase of alternatives.* The dimensions of the subject have increased more than 10,000 times in three centuries, but the number of alternatives existing for every building have increased in an unbelievable way. Because of the much greater number of building materials and technologies than at any time in the past, the number of feasible solutions to architectural problems is, perhaps 100 times greater. Similarly, the number of different types of buildings needed has increased 10 times at least. However, the number of solutions has enormously increased, because every culture today knows a great deal about the other cultures in the world. This may have increased the cultural heritage 100 times. Finally, the number of experts and schools of thought has also increased perhaps 100 times. The result is that the choices for a new building are made from among 10,000,000 possibilities or 107 more alternatives than in the past. Although Man has a much better preparation to create a better solution, he has lost his road. The increase of dimensions by 10^4 and the increase of alternatives by 10^7 has led to a disastrous spectrum of choices in which we have gotten lost.

- *The third cause: the loss of cultural continuity.* As a result of the previous causes we have witnessed a new phenomenon: the lack of cultural continuity or the loss of an understanding of human experience and its lessons which were recognized a few generations ago. Historically, invasions of new people, such as the Dorians in Greece, have often caused a loss of continuity. It seems now that the invasion or new forces (new dimensions and alternatives) has resulted in the same interruption of cultural continuity which was in the past caused by "barbarians".

- *The fourth cause: man, the measure of our world has become forgotten.* One result of the loss of cultural continuity is that we have lost the ability to measure our phenomena and decide on our goals and objectives on the basis of the only thing that matters: Man himself.

- *The fifth cause: we do not have people who understand the whole subject.* Though this is definitely a result of the previous causes, it has become a cause in its own right. We now train excellent experts – never before have we had people with such knowledge of transportation or structural engineering as now – but we have over-specialized and as a result the explosion of knowledge has led to many people knowing each aspect of the subject much better than before but no-one who understands the whole subject: the city of Man.

- *The sixth cause: change in the designer-builder owner relationship.* This is an important cause, added during the research discussions, which demonstrates the danger of splitting responsibilities among too many people.

- *The seventh cause: imposition of foreign culture.* This was also added in the research discussions, and is important if we think of the many forces which infiltrate the developing nations from the so-called developed ones, meaning they are economically and technologically more advanced,

though they may well be less well balanced with nature.
• *The eighth cause: the lack of the architecture we need.*
We have become overwhelmed by the problems. We are confused. We do not understand the city and we do not have the proper architecture for our time.

Some people blame the architects for this failure. They are right if we remember that they do not refer to specialized aspects of architecture or to all architects (some of whom have not failed), but to the average architect of the world, the expert in building the Shells that humanity badly needs.

We have already mentioned some of the many forces, which form the great Goliath of the modern city. Before him stands the architect, a small David who is losing the battle. Is David responsible?

The man who did not commit crimes

We have to learn from him

If we see so many criminals around us we begin to feel like members of a criminal gang, and to wonder whether there was any Man who did not commit architectural crimes. We can discover this Man back in time; the Man who learned, by trial and error. He did not face the problems of today's dimensions and he had more time at his disposal. He even had opportunities to start afresh when his settlements were destroyed.

If we look back carefully we can find this Man – the builder of many cultures – who may have disappeared a few generations ago. He was not always a good Man. Often he was a cruel feudal lord or a war lord. In some ways he was a great criminal but he had learned not to commit architectural crimes.

I present two ways in which we can learn from this Man of the past:

His first lesson: the ancient Greek city. We so admire it, we so praise it, but we only study it in terms of history or archaeology, art and style, not for what we can learn of Man's basic characteristics and the ways in which he filled his needs.

The Athens Center of Ekistics is now making this attempt. We are beginning to measure the basic characteristics of the human scale. If we can connect the solutions with their causes (the biological and physiological needs of Man) we can learn how a culture which developed over thousands of years created the buildings that we admire so much today. The main goal of this study is to understand the basic principles of the solutions.

His second lesson: the creation of the human room. We all live in a fundamentally standard type of room, which we usually consider as traditional and which some of us try to change. The truth is that the now universally accepted room was not accepted initially. Many people started with completely different rooms in terms of dimensions, form, and construction, but once they arrived at the orthogonal form with certain dimensions of size and height, they never changed it. We too cannot change it without suffering. The room is really a biological extension of Man. We have to understand it and learn that our buildings are conditioned by Man; not Man the criminal but Man the builder for Man.

Repentance and action

We have confessed our crimes and have tried to learn from these men of the past who did not commit them. Confession and education, however, is not enough. We have to act. Here are some proposals for experimental action to be undertaken, connecting experience from the past and an understanding of the present so as to form proper contemporary human solutions.

• *First proposal: punishment and reward.* For every crime that makes the people suffer we must impose a proper punishment. How else are those responsible going to learn not to repeat their crimes? This will not be easy; in many cases it will be extremely difficult; but we must find ways. The people who own tall towers, for instance, should pay much greater taxes than others, because they put a much greater burden upon the city. Similarly, people who own buildings which improve the city should pay less taxes.
• *Second proposal: elimination of criminal features and functions.* We cannot demolish all tall towers, although some of them will have to be demolished, but we can turn fortresses into human buildings. We can impose a special tax on all buildings whose ground floor is not open to the people of the city as a system of human interaction. If they enclose themselves with marble walls, if they turn their back upon me as a citizen, they will have to pay for it.
The more a building is open to the city and to social interaction, the less it will pay. The owners will start thinking less of monuments than of serving the people and the city.
• *Third proposal: the human house.* We need regulations which prevent the creation of non-human houses such as tower apartments for families with children, or houses without courtyards or gardens. No more such non-human houses should be allowed to be built. The existing ones should be taxed in a way that will force them gradually out of existence. We know the sort of houses our children need. Why not require that such houses be built and forbid construction of those which do our children harm? Don't we do this for food, and now for pollution?
• *Fourth proposal: housing for the extended family.* It is time for us to understand that it is not enough to speak of the need for a contemporary resurgence of the extended family. We have to create an environment which will facilitate its resurgence. Special regulations must be passed for this purpose and special advantages, mostly in taxes, have to be given the people who construct this type of building cluster which we so badly need.
• *Fifth proposal: human streets and squares.* To try to fight air pollution while doing nothing about the criminal pollution of human space by machines is neither intelligent nor honest. We must create human streets and squares where the pedestrian is in control. To achieve this we need regulations for new developments and tax benefits for those existing ones which can be gradually transformed into human environments. If *a* residential street is closed to the automobile the residents will pay less property taxes and will raise happier children.
• *Sixth proposal: the human community.* We have begun to realize that we badly need communities in human scale. We must introduce new types of regulation for these communities. Consider, for example, the great confusion created by the immense number of choices in building materials and house forms alone. We should not limit alternatives because that would slow progress, but we can define areas of limited alternatives. For example, one community may decide on one and two story houses with pedestrian walks and with all buildings constructed of bricks and clay products (another community may limit itself to concrete, and another to steel or aluminum). In such a way we would not limit alternatives but we would give people choices in an orderly environment. It is the order we need. This would increase higher quality through competition among communities each of which will have its own character. If a community prefers to allow complete freedom for all types of buildings, let it do so. We shall then see what kind of communities Man will gradually support; the ones with local order in a chaotic city or the ones with disorder. Let us give Man his chance and we will

see.
• *Seventh proposal: regulations and taxation.* We have to alter our regulations and we have to help changes to occur through taxation. These two means have to be used on every occasion when we can demonstrate that they are supporting non-criminal solutions and alternatives. The city has to permit all choices, encouraging the best and punishing the crimes.

The death of the dinosaurs

What is going to happen if we do not act immediately? Are the criminal tower apartments and fortress-like monuments going to survive forever? I don't think so for I believe that Man always learns, although slowly. These criminal buildings are going to die like their medieval counterparts of the past.

Some of them will remain as historical landmarks, such as the Tower of London, which you visit but you don't copy.

The criminal buildings will die and disappear as did the dinosaurs, but it will take time. Humanity will suffer in the meantime. It is our duty not to wait patiently for the death of the dinosaurs but to fight for their extermination.

I can see only three ways to do this:
• Proceed by reasoning. Develop an objective and scientific approach to implement the right solutions with intellectual and moral courage.
• Turn to psychiatrists for those who cannot follow the first way.
• Pray for those who cannot understand the first way and who cannot accept the second.

I believe that the first way can work for most of the people most of the time. Let us try it, and the dinosaurs will die.
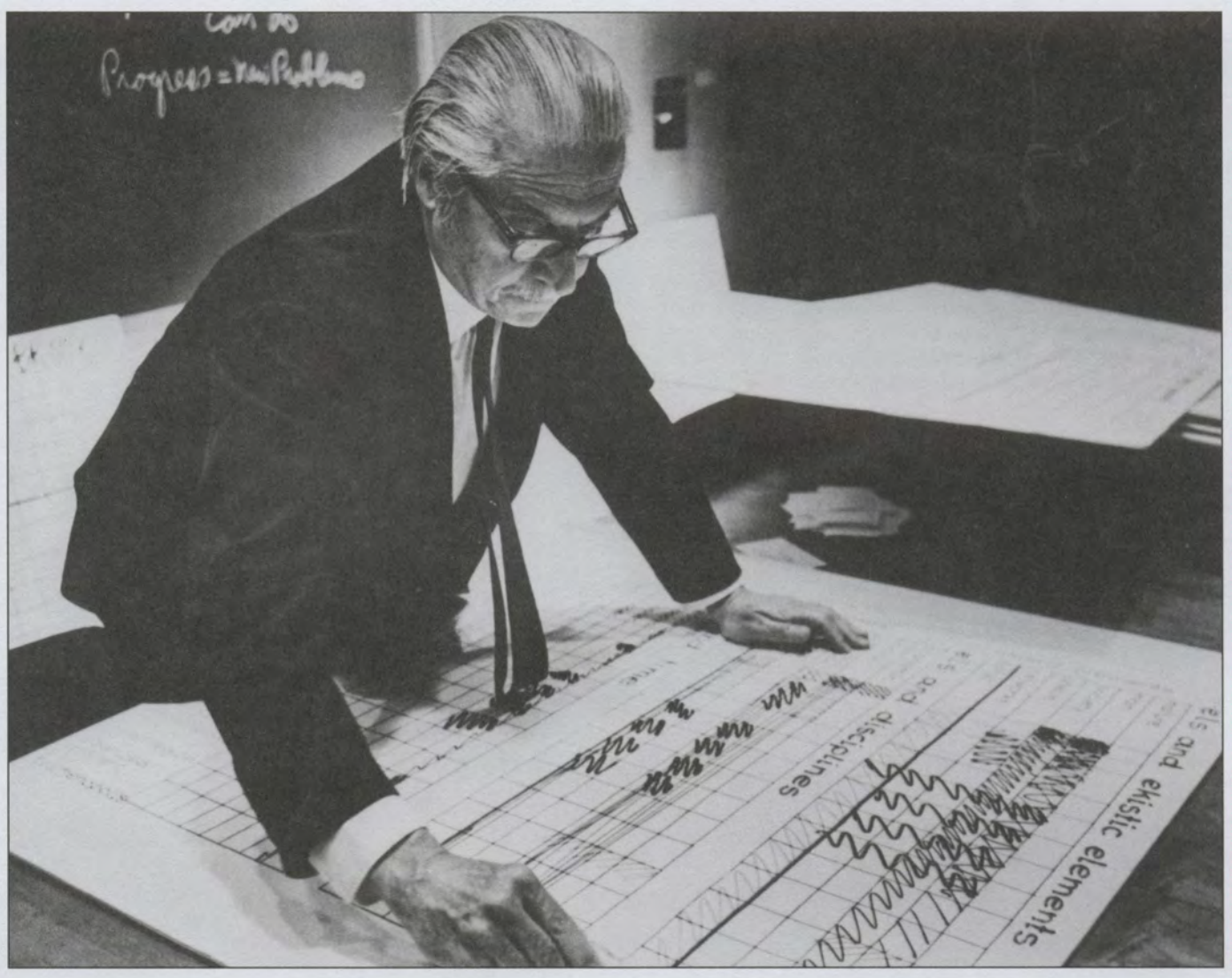
At the C.A. Doxiadis' lectures at the State University of New York, USA, 28-29 April, 1970. (*Source:* © Constantinos A. Doxiadis Archives of the Constantinos and Emma Doxiadis Foundation).

Methodology of action

Introduction

It will be a realistic goal to expect that humanity can achieve the following:

*   Recognize the content and extent of the problem of human settlements in the 1960s;
*   Develop proper and accepted systems, theories and solutions in the 1970s;
*   Experiment in order to test the theories at a proper scale in all types of units, countries and areas in the 1980s and 1990s;
*   Reach the point at which humanity will be in control of the situation of human settlements again by the turn of the century.

Whilst working, though, on such a systematic and long-term program, we cannot overlook the fact that we have immediate needs for action which cannot be delayed until we know best. This is why we have a second task: to act to the best of our knowledge in order to ameliorate and expand the human habitat.

In acting in this field we do not simply create new parts of the settlements, we also interfere with existing settlements, some of which have been very satisfactory ones, especially those which took a final shape before the nineteenth century, and before the new forces changed their nature. If we leave these settlements to develop under the impact of the new forces, then by the end of the century they may have been completely changed for the worse, and this is going to mean a great loss for humanity. Then, when some day we recognize the value of the settlements of the past, they will not be there any more. They will have been lost for ever.

It becomes, therefore, our third task to save as many as possible of the values created in the settlements of the past, as well as the settlements themselves, until man, in control of the situation again, can deal wisely with all problems of settlements of the past and of the future.

As a conclusion, I think that we face a triple task during the decades to come:

*   Develop the science of human settlements and act on the basis of its findings;
*   Till this happens, act to the best of our knowledge in order to face critical situations in many types of settlements, in both underdeveloped and overdeveloped settlements;
*   Act in order to save values of the settlements of the past, which are being spoiled under the impact of new forces.

Policies and programming

For ekistic development we need to clarify our goals, not just following trends but determining where we want to go. Then we need to set the policies to determine the road that will lead us from B to E, and not to D or even C (fig. 1). After that we need a program determining the method of implementing our policies. Finally comes the physical plan – a partial projection of the foregoing in two or three dimensions.
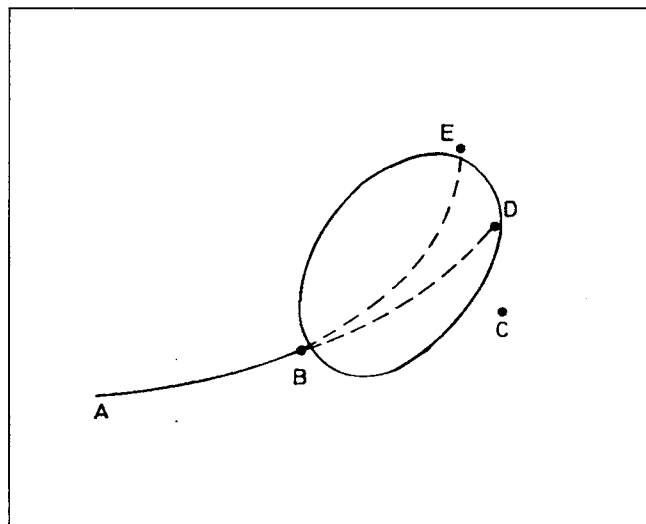
Fig. 1: We need to set our goal at E, not D.

*   **Goals:** The goals must be decided by the community and not by the expert. The task of the expert is to present the advantages and disadvantages of different courses of action in measurable terms, and then let the people decide. It is better to have limited, specific goals than generalized objectives: better to advocate a maximum commuting journey of 30 minutes than "increased leisure." Goals can be set for the five ekistic elements and for different ekistic units and for different organs of the city. They should always be expressed in terms of physical space and time budgets in relation to how the citizen spends his 24 hours.

*   **Policies:** Policies always exist, even if they are not expressed in laws (some countries have a policy of doing nothing about housing for the poor). Our task is to bring the main issues up to the surface so that the people will have to take a position. Urban renewal can never be a policy since it is a form of surgery, and operations are dangerous, critical actions that should only be undertaken in an emergency. The policy should be long-term preventive action that will prevent emergencies from arising.

• **Programs:** Programs are guided growth. What is impossible today will be possible in five years, and easy in ten. Even in the distant past man set goals for the future. The Acropolis could never have been built under a five-year plan. Some cathedrals were under construction for two centuries. These people had faith in the future.

A city consists of buildings born 100 years ago, 50 years, 10 years. It is a complex structure that is going to live a long time. Does it make any sense to plan for its future with short-term programs – with one-year and five-year budgets?

Many cities are growing at the rate of 10 percent a year. This means annually 3 to 4 percent increase in population, 4 to 5 percent increase in incomes, 3 to 4 percent increase in public services. In other words the city doubles in seven to eight years. Thus, even if one only aims to guide new growth, there will be a great impact within ten years.

• **Physical plans:** These are only two-dimensional diagrams of *a* four-dimensional projection. They must always bear two dates: the date of their conception and the date of their intended realization. Without these two dates they are meaningless.

Conclusions

We are heading toward an earth with more people, more wealth, greater technological skill and more concentration in favorable areas of the globe. This means larger and more complex human settlements. Our task is to understand the irreversible trends and to create human conditions.

Cities are already inhuman in their dimensions. It is imperative to save the human scale and to create spaces corresponding to man's natural dimensions within a total inhuman framework. There are two scales we must bear in mind: the scale of man (the human scale) and the scale of many men coming together (nonhuman dimensions). We need a policy for stability at the human scale and for dynamic change in the nonhuman areas. To achieve this the repeatable human scale units must have practical dimensions.

The walking scale urban units of ancient cities measured roughly 2,000 m x 2,000 m. In a modern metropolis such human scale units have to be connected in a hierarchical structure to bridge the gulf between the human scale of the indispensable units and the nonhuman scale of the inevitable units.

A possible system is to create major units each 10 km by 10 km (6 miles square), each containing 25 human communities (2,000 x 2,000 m). How many human communities are needed to support major urban institutions? Technology gives no answers and social scientists' standards change with an evolving society. To meet the changing demands of society, we should develop a recognizable urban system that creates a frame for all sorts of different developments. To do this we have to organize space as objectively as possible in three ways: the human community, the unpredictable total, and a hierarchical system of interrelations.

Note on implementation

This is a kind of recommendation to young professionals now entering the field, based on my own experience derived from practice. I am sure those who have had some experience will have already come to many of the same conclusions.

• **Starting the process:** Do not speak about planning needs. Nobody understands what we mean by the need for planning. Ordinary people are not interested in planning or in the need for planning; this is technical terminology.

Speak instead about the problems of the people and start at the proper level, with the authorities. But if you fail here, then start at any possible level.

• **Selecting the study area:** The area of study should be as large as possible, because if you select an area which is only a small part of a living organism, you will have already started on the wrong foot.

Give reasonable boundaries to the area. Do not select three-quarters of an organism, missing perhaps the one-quarter where most of the new action is taking place and where the interest of the community is centered.

These two statements may be misleading if I do not add a third one. While I recommend as large an area as possible – the largest possible kinetic field – one cannot always have it in practice. In such a case accept a smaller area, but be sure that it has reasonable boundaries.

Thus here I defend two positions. You have an expanding organism. Try to see how far its forces extend and try to cover the whole area. Have proper boundaries. But if this is not possible, if you are just given a small part, take it, because the process can also start at very small levels. But in that case, be sure that it corresponds to natural boundaries. If not, adjust it, no matter if your client does not want this. Study it as a unit, with reasonable boundaries, and give the answers for this unit.

If you have to take this small unit, try to see it in the frame around it. Spend some of your time on this. And then, and this is very important, try to look at all aspects within it. Do not imagine that you can solve the traffic problem by turning to the engineers, who may think that by designing a new traffic system within the unit they can solve its problems. Sometimes they kill it. So try to look at all aspects and develop an approach for the whole settlement.

• **Presenting the plans:** I think we should feel obliged to show clearly both the present and the future problems. We must express these in human, understandable terms; then present the alternatives. Not a single solution, but alternatives. No one will accept your favorite solution unless he has seen other alternatives, and understood the reasons why you rejected them.

Recommend each alternative on the basis of goals and criteria, and (this is very important) do not give your own opinions. No one is interested in your opinions: they are only interested in facts. The idea – often held by planners and experts in urban affairs – that the world waits for his wisdom, is very wrong. The world wants the facts of the problems (or the diseases) to be superimposed with facts on alternative solutions and the methods by which these were selected.

• **Approval of the plans:** Let those who are responsible approve the plans. Do not try to convince them, just give them facts; because, if you are a good salesman, you may convince them to accept things they do not want, and then they will spoil everything as soon as you turn your back. It is better for them to have their own plan and believe in it and implement it, than to have "your plan."

The expression "your plan" has no meaning. When I am told, this is "your plan" for that city, I strongly resist it. This is a selected proposal, and if approved, it will become the plan of the city. Otherwise it is a plan with no value at all, perhaps not even a historical value. Who will pay attention to the thousands of volumes of unimplemented master plans lying in the libraries of so many countries?

• **Implementation of the plans:** Finally, once the community has accepted a plan, we must have the courage to go ahead of the people, and start committing the community. I could mention the cases of many cities which we admire today where action was started before decisions were completed.

I have presented here a kind of bricklayer's experience and recommendations. With this I shall close. The future depends on you.

We must understand that the Nature-made and Anthropos-made systems must merge into one. The way to do it is to marry them happily together so that they can live forever without disputes and separation. To achieve this goal we must do the following:

- Understand Nature through geography, ecology, etc.
- Understand human settlements through their own science, that is, ekistics.
- Analyze the whole region into which the human settlements we are studying will grow in order to understand the values of those parts of Nature that have to be saved.

- Evaluate these parts in terms of the five Naturarea zones and in terms of the two Cultivarea zones. Assign them the degree to which they must be saved (from 100 to 0).
- Analyze the five Anthroparea and Industrarea zones which will be taken over by humans and changed basically. Calculate the total surface of each such zone and its probable locations.
- Evaluate these zones and their probable locations (from 0 to 100).
- Now that we have delimited the two systems and evaluated them, we face the most difficult task: to merge them together.

If we can follow this road properly, in several generations the global city or Ecumenopolis will be married with the global garden or Ecumenokepos.

Islamabad, the creation of a new capital

The text that follows is a slightly edited version of a document by C.A. Doxiadis extracted from The Town Planning Review, *vol. 36, no. 1, April 1965, pp. 1-36.*

Introduction

The subject

My subject is the problem of the creation of a new capital city and its solution. I will analyse and present it as a general case of interest to all of us, and as an illustration I will take the example of Islamabad, the new capital of Pakistan which was conceived in 1959, planned from 1959 to 1963, and which entered the implementation phase in 1961.

The analysis and presentation of this problem as a general case is necessary because in the field of human settlements we are inclined to attach too much importance to the example and tend to imitate it; whereas what are important are the underlying principles which led to the specific solution – a solution which in some ways is coincidental, as it represents the application of principles of general validity on specific (coincidental) features of nature.

On the other hand, I am taking a specific example in order to illustrate the general problem we are facing, for without the specific we cannot easily demonstrate the practical importance of our general theories; Islamabad has been chosen since, to the best of my knowledge, it demonstrates in actual practice, and in the best possible way, the implementation of my analysis.

In our generation, up to the end of this century, we are going to build many new cities and capitals, and we must develop a systematic approach and look at it as both theory and practice. I hope that this article will help us to begin such a discussion.

A multi-dimensional subject

A human settlement is a multi-dimensional subject, and it is always a great problem to present it: how can I give a complete and systematic picture of it? We can present a settlement through its plans, in which case we overemphasize its two main dimensions and seldom its third one, that of height. This was done much better in Medieval and Renaissance cities or in Moghul monuments through three-dimensional plans, either as perspectives of the settlements or as a geometric two-dimensional projection of the third dimension on the same plan. Even in such a case we completely miss the fourth dimension – that of time – which is indispensable for the existence and use of any settlement.

But even the best plans show only two or three of the elements of a settlement (shells, networks and nature), and we miss the other two, man and society. We must find ways to present these, as well as all the aspects of a settlement, economic, social, administrative, technological, cultural, etc.

With such a complicated multi-dimensional subject a systematic approach would necessitate our following one line in one dimension and studying the elements of the second dimension along it, then repeating the same process with a second line, etc. (fig. 1a). But such a process requires a long and laborious 'voyage' (fig. 1b), which cannot be undertaken in the space of this article. The simple fact that during the planning period our office had to prepare more than 4,000 different drawings and documents, a total of more than 8,000 pages, shows how such a task is impossible here. Apart from that, the application of the method I suggested above can be boring even with a two-dimensional subject; when dealing with as many dimensions as a new settlement has, it may be indispensable for proper analysis, but impossible to present.
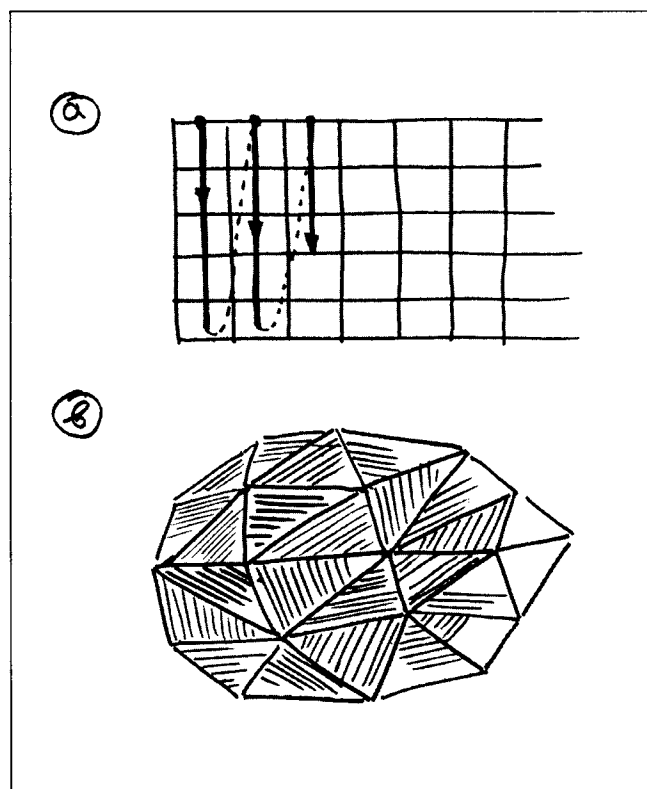
Fig. 1: A multi-dimensional subject.

Outline

As I cannot present all the dimensions or aspects of our subject, I have selected some of the most important ones and have tried to present them in text (a one-dimensional way) with plans, drawings and photographs (two and three-dimensional illustrations).

Thus I follow a simple road by answering the practical questions:
• Why?
• Where?
• How?
• What?

and then by presenting the city of Islamabad as conceived, designed, and as it now enters the phase of construction.

In following this road I will mention only certain considerations and very few dimensions out of the multitude of factors which enter the game at every decisive moment, and will give the result in some key plans and photographs in the last part of this article.

Why?

General considerations

Many countries which have recently become independent have no capital cities, either because the capital city of their area remained in another country (as was the case of Delhi, which remained in India as its capital city) or because there was no capital city in its territory with the necessary facilities or in a proper location. The same occurred with several regions which remained without a capital city, such as Punjab, the capital and main part of which became part of Pakistan – thus forcing India to create Chandigarh as a regional capital.

Such countries or regions must create a capital city to house their central functions. Such was the case with Pakistan. The city of Karachi was first selected. Right from the beginning, though, the question arose as to whether Karachi was the best solution as a capital city or whether a new capital city should be created.

This is the most important question to be asked in such a case: *why* a country needs a new capital city, and why the existing one is not satisfactory. Many people tend to believe that this is a matter of prestige; but whether it is or not has to be seen in the light of several aspects of this problem, some of which I will present briefly below.

Economic aspect

The main argument of those who are against the creation of a new capital is that a new country cannot afford such a luxury. But it so happens that a new city often has to be created exactly for economic reasons.

The functions of a capital city are determined by the size and organization of the country. A capital city means so many square feet of office buildings, so many square feet of residences of certain classes, and so many corresponding facilities, from shopping and entertainment to roads and sewers.

If an existing city has such facilities and is properly located, the country has a capital. But if the country has cities, even in proper locations, without the necessary facilities, the question can be answered only by correct calculations. Such calculations in the case of Karachi proved that the city was over-congested (having overnight become the only port town in West Pakistan, with its forty million people), and the proper functioning of the administration would have meant the construction of public buildings, residences and facilities of a certain magnitude.

The question then arose: given the task of investing in buildings, residences and facilities, should these be added to an existing city, or to a new area? Investigation proved that there were two main economic arguments in favour of a new city:

• If such investment took place within the existing city, about fifty per cent of it should go towards the acquisition of land, the widening of streets and the remodelling of facilities to serve the new functions. This meant that the capital expenditure per square foot of administrative building would be *double* in the existing city.
• If such an investment took place in a new non-developed area, the increased land value of the surrounding area would go to the government – which would initiate action and investment – and not to those who *happened* to be land-owners near the new government developments.

Both of these were strong economic arguments for the creation of a new-capital city (fig. 2).
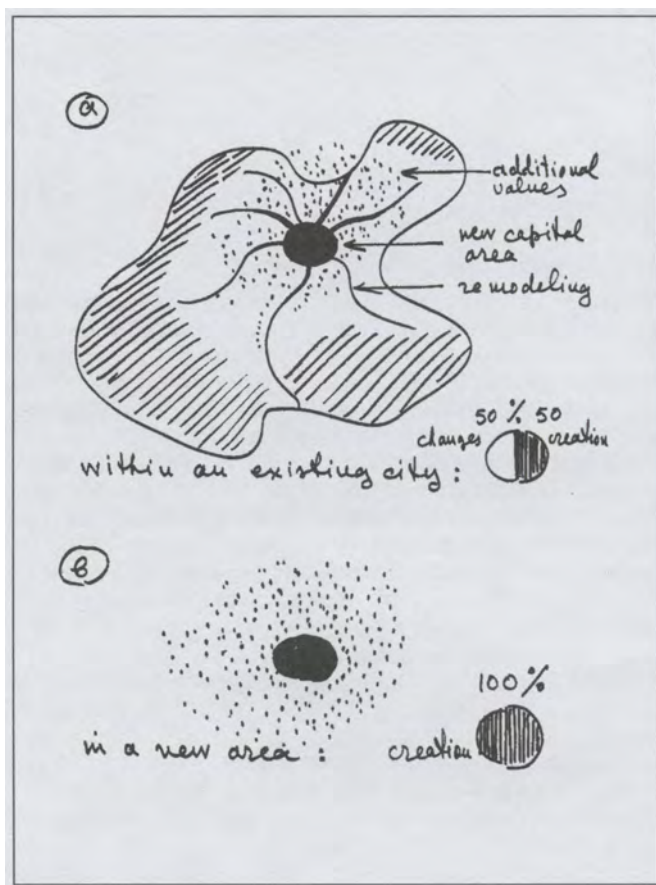
Fig. 2: Economic alternatives.

The question remained open as to whether the creation of a new capital city would not require greater expenditure for access roads and other indispensable networks (power, gas, water, etc.), but this question will be dealt with when we investigate the 'where'?

Social aspects

A capital city exercises great influence on the entire country. Thus its inhabitants should not belong only to one social group (economic, political, ethnic, etc.), but should belong to as many groups as possible – in ratios corresponding as close-

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ly as is feasible to the national ratios – so that its population is the best possible representation of the nation as a whole, and not of any specific group (fig. 3).
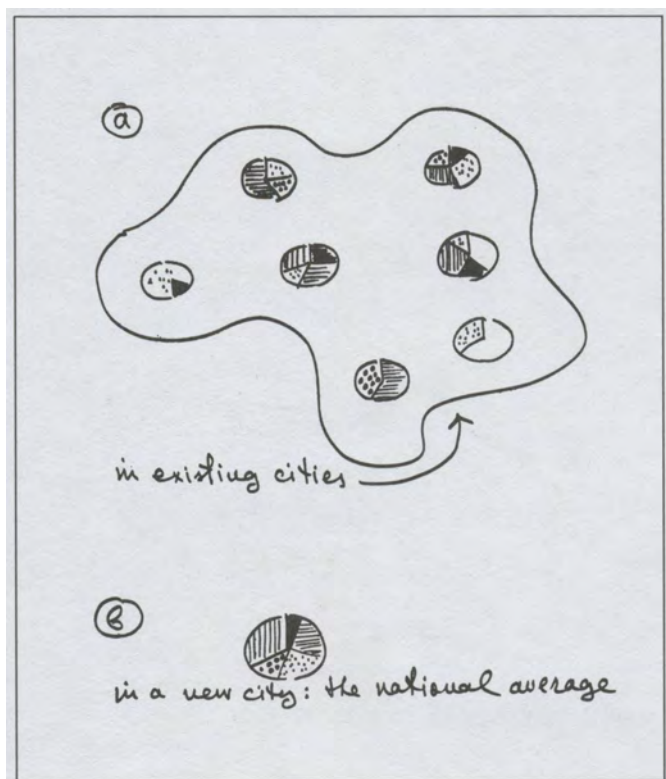
Fig. 3: Social structure.

From this point of view the creation of a new city is imperative, as existing cities do not represent the nation as a whole unless they happen to have served as capitals over long periods. Failing that, we conclude that from the social point of view a new capital city is imperative.

Technological and cultural aspects

Existing cities are old cities and thus, both from the technological and cultural points of view, do not represent the future but the past. If this past has value, it should not be spoiled by the creation of new functions in new buildings and facilities; if it has no value, it does not represent any asset.

Seen from this point of view, the creation of a capital city of a newly independent country must either take place in an existing city (whose past is of value and it happens to have ample buildings and facilities), or, if this is not the case (and this was not the case with any city in Pakistan), it is better for it to be created without any commitments to the past. If it cannot represent the great values of the past, it is better to open the road for the values of the future.

Ekistic aspects

If a nation must create its most important ekistic functions in the capital – since it represents in national buildings and corresponding facilities the greatest ekistic investment in economic or cultural terms – it is wise to think carefully about its ekistic future. Don't we do the same if we have to build a great thermo-electric plant? We do not simply add it on to an existing antiquated power station.

Here, certain trends are unavoidable. First, the population will continue to increase; and secondly, we must expect this
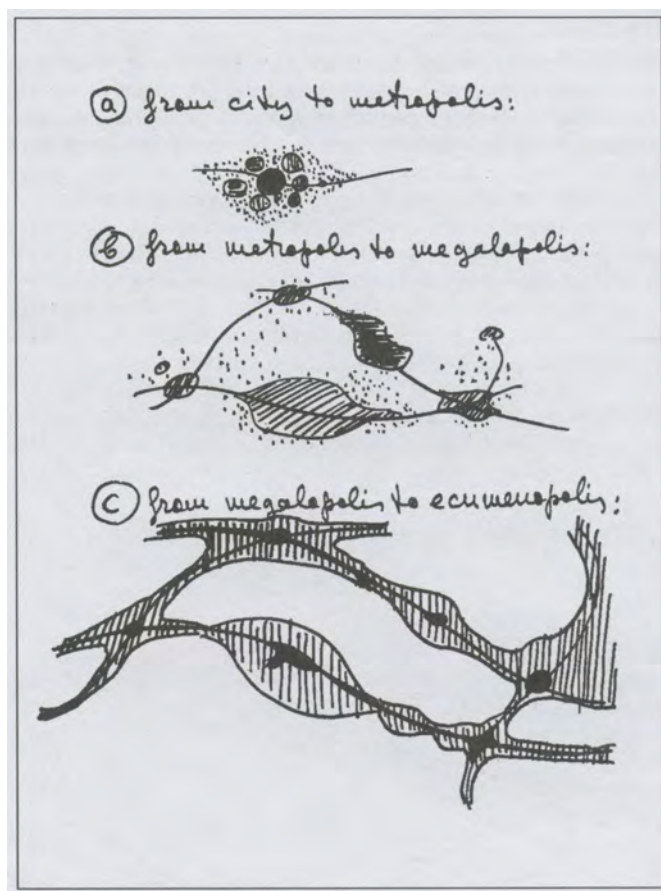
Fig. 4: Towards Ecumenopolis.

additional population to become almost entirely urban, which means an unprecedented increase in the urban population. Such countries as Pakistan are entering the era of urbanization. During this era we must expect the cities to grow dynamically and many a city to turn into a metropolis (fig. 4a), then become a part of a megalopolis (fig. 4b), until it becomes a link in the greatest city that man has ever seen, which is going to cover regions and continents with its branches – the universal city, or ecumenopolis (fig. 4c).

We cannot expect these great urban organisms to function properly unless we create the proper nuclei for them, and do not leave the old cities of the past to bear the burden of the proper functioning of a universal city.

So from the ekistic point of view, too, Pakistan needed a new capital city.

Where?

General considerations

There are many considerations leading to the selection of the site of a city and they can be classified in many ways according to several dimensions – from geographic and climatic, to economic, financial, social, political (international and national), defensive, administrative, technological (from transportation to resources), cultural and aesthetic, from historical to philosophical, and from material to spiritual. This work was done by dozens of experts in corresponding committees and their decision represents the synthesis of a multitude of views, some of which, together with corresponding problems and solutions, I will illustrate below.

Centres of gravity

The basic consideration for anyone studying the location of a capital city is that it should lie in the centre of gravity of its total area. There is no dispute, therefore, when the theorists of the ideal state locate the capital in the centre of a circle (fig. 5a). But this presupposes a circular and uniform area.

By extending this line of thought we conclude that even if the area is irregular its centre of gravity must be found (fig. 5b). But again we have assumed a uniformity of area. If this is not the case, we must decide whether we want the centre of gravity to be that of the fertile land (fig. 5c), of the population (fig. 5d), of the system of transportation (fig. 5e) or whether we want all these factors to be considered as they are or as they are going to be after due development (fig. 5f). We then want to find the centre of gravity of all the centres of gravity and what kind of coefficients to use in order to balance all possible factors (fig. 5g).
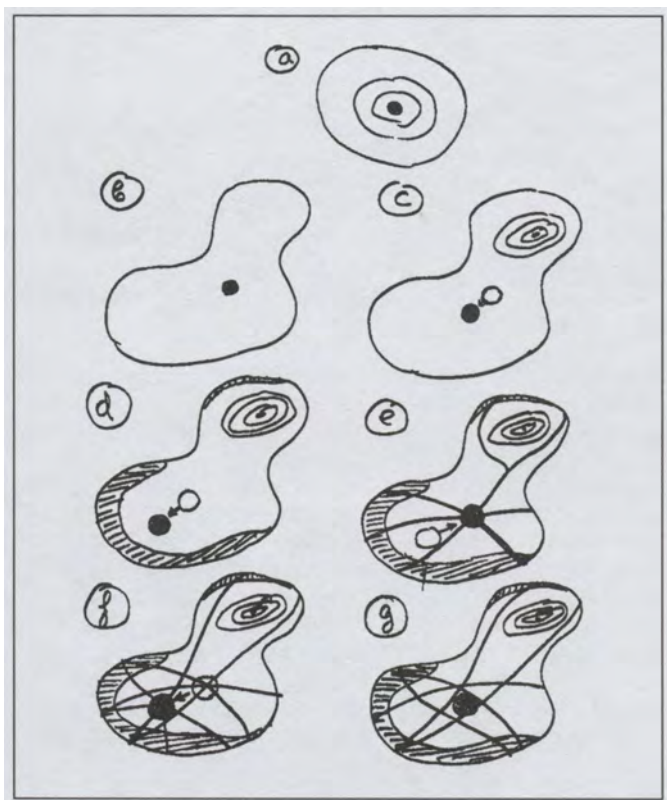
Fig. 5: Centres of gravity of an isolated state.

But then we discover that in this whole analysis we have been thinking in terms of an isolated state. If we think of it as a part of the whole world we must exclude border areas (fig. 6a) and place much greater importance on the lines connecting our state with the outside world, in which case we may well have one centre imposed by the sea, others by land and air-transportation, and another as the result of all these (fig. 6b). We can then proceed to the synthesis of these views with those derived from the considerations of an isolated state and reach even different conclusions (fig. 6c).

It is quite clear that the simple notion of centres of gravity needs great elaboration and every aspect of it requires proper evaluation in order to lead to the final synthesis. And what happens if after such an analysis we discover that the 'centre of centres' lies on a mountain or in a desert?
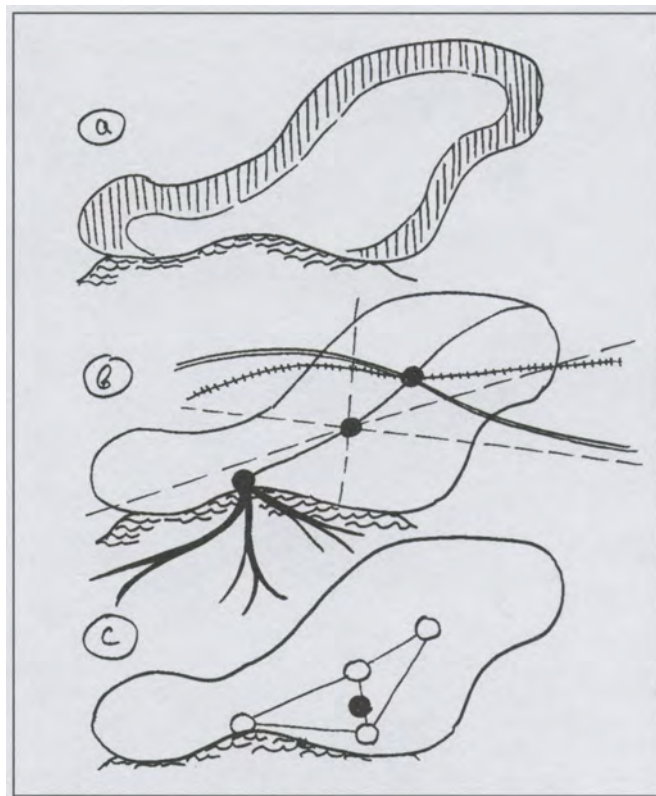
Fig. 6: Centres of gravity of a part of the world.

The past

Such difficulties lead us to think of other ways to see our problem more clearly and facilitate its solution. One such method is the history of the area. If the present situation is not very different (in inhabited areas, economy, transportation, population, etc.) from the past, a study of where successful capital cities existed can lead to useful conclusions.

In our case it was quite clear that there was only one strip of land on which most of the successful capitals existed for centuries, and this was along the Grand Trunk Road of the Indian peninsula. Teheran, Kabul, Peshawar, Lahore and Delhi marked this line, and when Alexander invaded this area, it was in Taxila that he created his capital. The British had to move from Calcutta to Delhi. Geographic and historical forces placed the capitals on the same line (fig. 7).
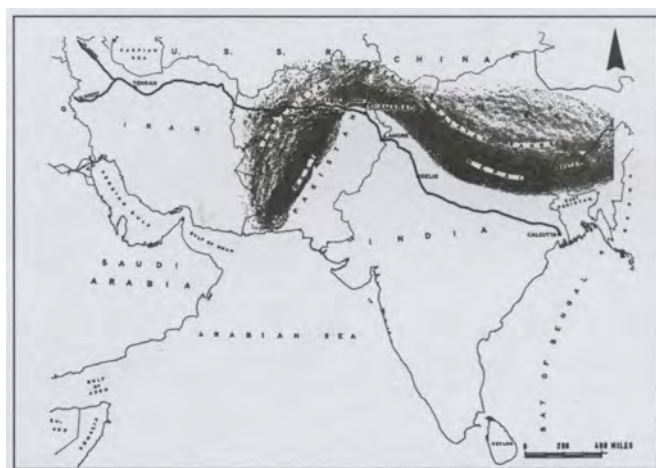
Fig. 7: The capitals of the area.
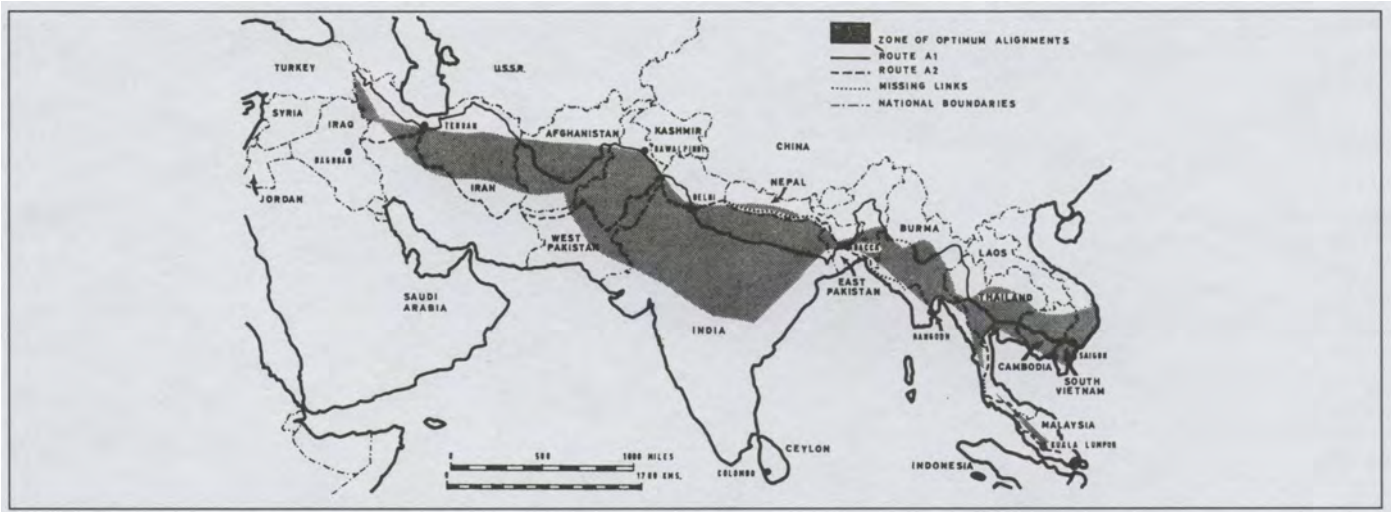
Fig. 8: The Asian Highway. Zone of optimum alignments as desined by gravity lines.

The future

Restricting our thoughts to the past can be misleading, unless we also have the ability to project them into the future. In our case this meant, mainly, an evaluation of whether the age-old importance of the historic backbone of Western Asia – the Grand Trunk Road – would lose its importance because of sea transportation.

A study of geographic, economic and other factors proved that it was very improbable that the centre of gravity of population, economy and activity would shift towards the sea. The desert areas and the climate of this part of the Indian peninsula prevented this from occurring. Thus, the three forces that would shape the settlement of the future (that is, the universal city or ecumenopolis) – the existing centres of gravity, the main lines of transportation and aesthetic-environmental forces – were going to operate in favour of the internal lines of transportation, as a recent study we carried out for the United Nations on the Trans-Asian highway has proved (fig. 8).

The solution

A series of analytical studies carried out by Pakistani experts, with the assistance of their consultants, showed that the best geographic location for the capital would be the northern part of the Potwar Plateau (fig. 9), which has many advantages:

• it is on Asia's main highway;
• it is on the crossroads of this highway and another main one entering the hills, Kashmir and the mountainous area of Asia;
• it is in one of the highest levels of the West Pakistan plain with the best climate;
• it is in the most developed part of the country; and,
• it is in a central location of the universal city of Asia.

The topographic selection of the specific site of the city followed the same type of analysis as the geographic location, but in addition, it was also based on many factors related to the questions of 'how' and 'what', which in my presentation by necessity follow the question of 'where'.

On the basis of all these considerations the site finally se-

Fig. 9: Geographic location.
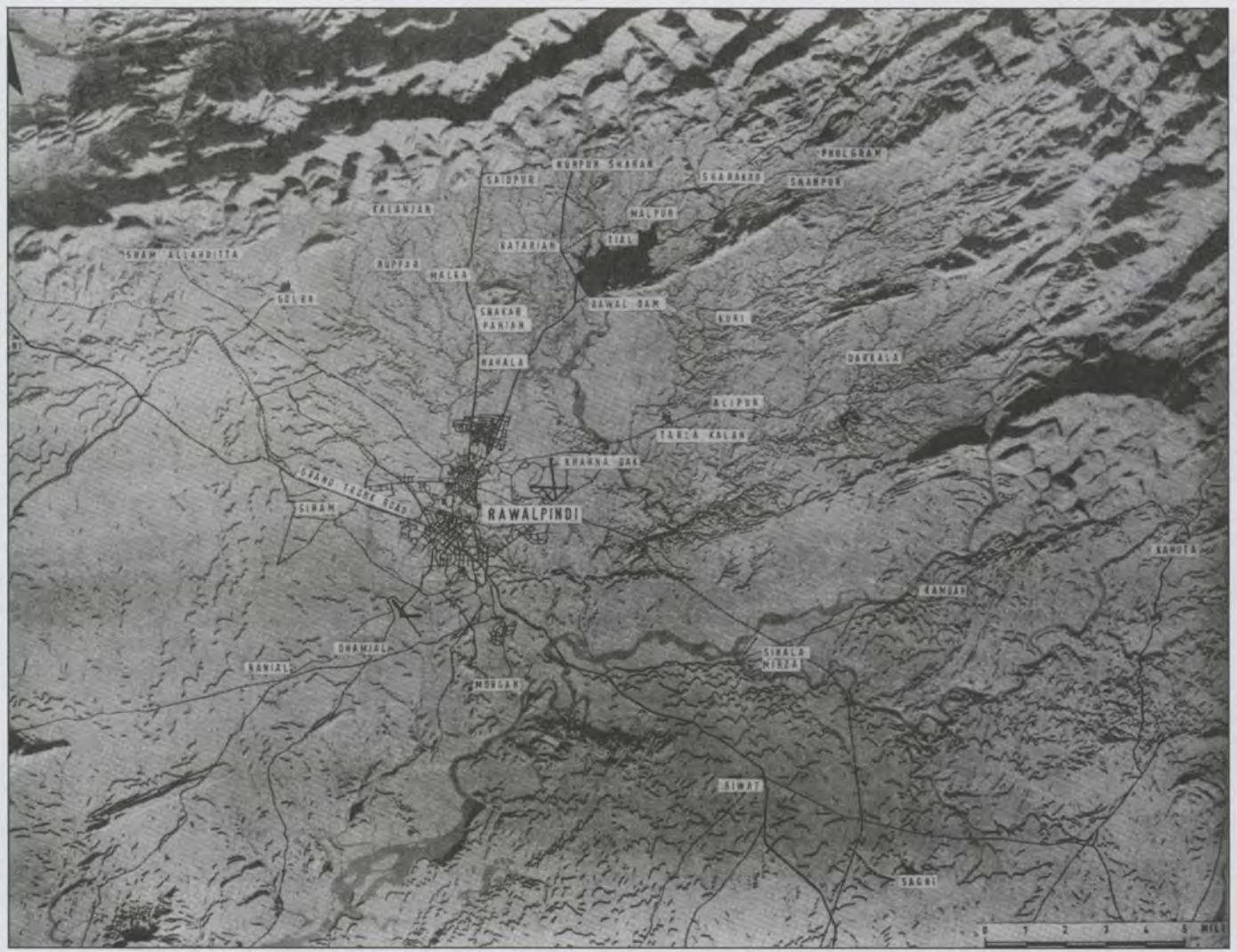
Fig. 10: Photograph of the model showing the topographic location of the metropolitan area (see also figs. 27a and 27b).

lected best (fig. 10) fulfills the combined requirements of setting in nature (climate, views, surroundings, etc.), technology of the city (transportation, water supply, sewage, drainage, etc.), and aesthetic cultural aspects – in a way which is economically within the limits imposed by the present and future incomes of the country and the city, and which allows for the necessity of a proper method of growth.

How?

Combination of elements

Any human settlement consists of five elements: nature, man, society, networks (roads, power, etc.) and shells (houses and buildings). The question now is, *how* do we create a new settlement out of these elements? We certainly must bring in new people and form a new society, but how do we deal with the other three elements?

We have the following alternatives of elements to be used (fig. 11):

• Nature alone
• Nature with networks
• Nature with shells
• Nature with networks and shells
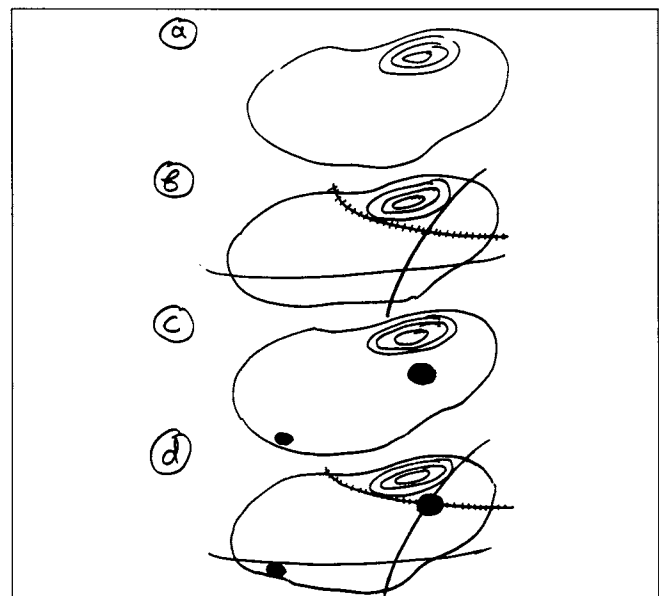
Fig. 11: Combination of elements.

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The first of these solutions creates the least commitments for the new settlements, but is the most difficult and expensive. The last is the easiest and cheapest, and it is reasonable to work with in order to guarantee the maximum success, especially when dealing with the economies of developing countries.

The creation

Once we decide to use existing shells and networks, we must answer the question of how to conceive the inter-relationship of existing shells with the one we will create. There are several possibilities:

• Create the new settlement around the existing one. Here we would have all the weaknesses of an old settlement plus additional ones.
• Create the new settlement next to the existing one, in which case we would have the previous weaknesses to a lesser degree.
• Create the new settlement at such a distance that we can minimize the weaknesses while making the best use of the existing settlement and its networks for the creation of the new one.

It is obvious that we must try to implement the third of these solutions by selecting a location the right distance from the existing settlement (fig. 12).
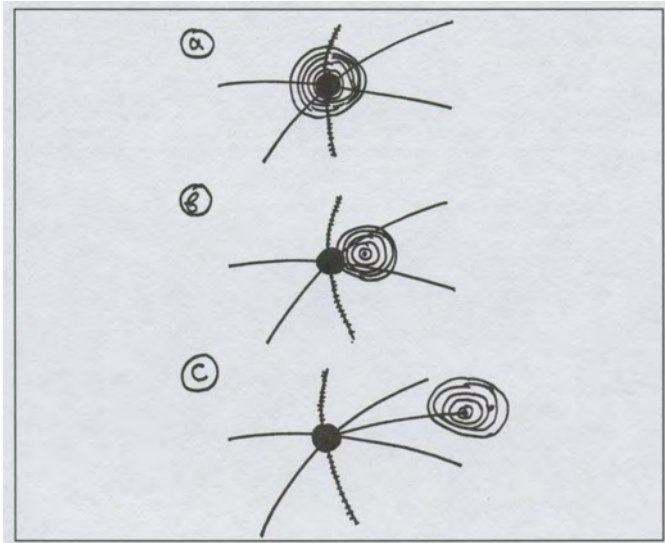
Fig. 12: The creation.

The growth

Once we have selected the proper distance for the creation of the new settlement, we can envisage its growth as a repetition of the growth process of certain newly-born animals.

First the newly-born completely depends on its mother: it is supported, guided and supplied with food by her (fig. 13a). Then its organs are developed but it is still guided and supplied by the parent organism (fig. 13b).

When the newly-born has its organs completely developed, it can cut the line connecting it with the parent organism (fig. 13c). But this does not happen in human settlements for here the process is, after a certain stage, reversed, and the newly-born supplies and guides the parent settlement (fig. 13d), until one day, by growing even more, it absorbs it within the broader organism; in other words, in the metropolitan area (fig. 13e).
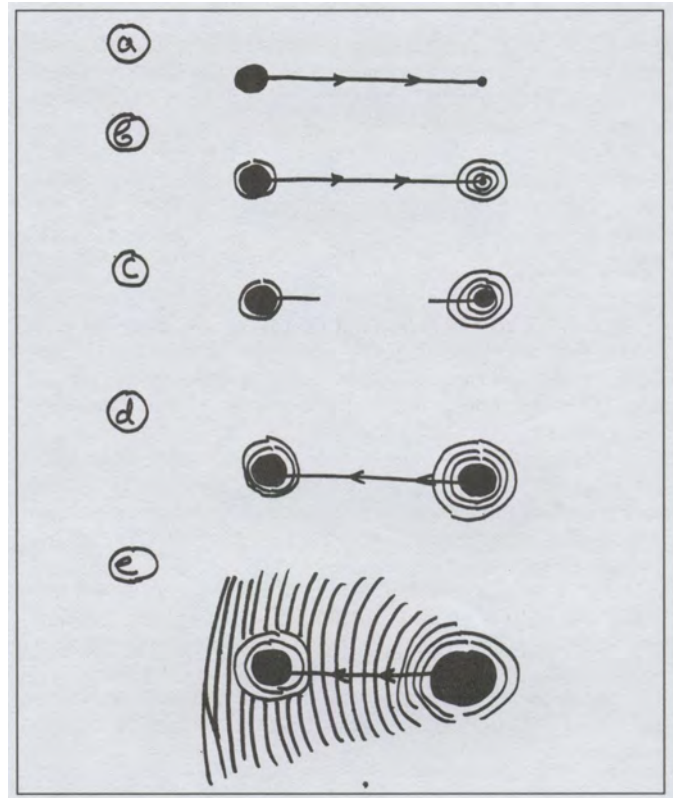
Fig. 13: The growth.

The formation

Speaking of growth I have illustrated my point by using concentric circles and assumed the settlement would grow like waves in the air or water. But this cannot happen. We always assume it as the most natural form because human settlements for thousands of years have grown in concentric circles (fig. 14a). But then they were small, with no more than a few hundred thousand people, and the rate of growth was slow.

Now settlements grow at a high speed with millions and tens of millions of people, and follow several lines of networks (fig. 14b). This has led some people to believe that we can have linear or star-like settlements (figs. 14c and 14d).
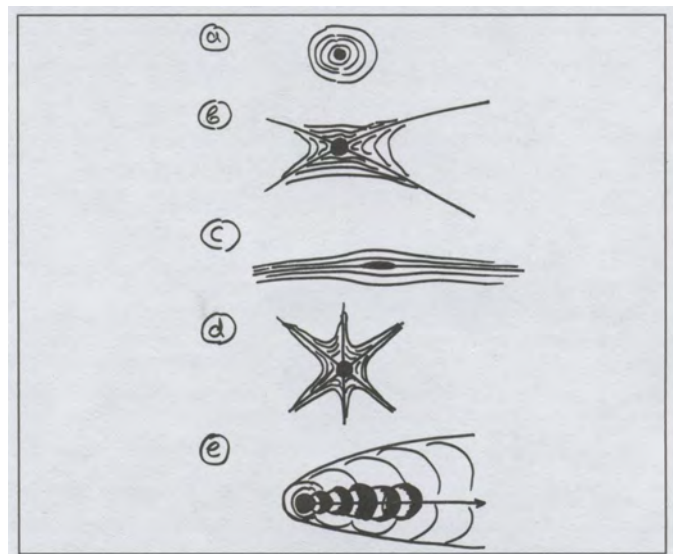
Fig. 14: The formation.

But these solutions cannot help a dynamically growing settlement, since all pressures are exercised on its centre, which is strangled to death. In addition this, the star-like forms have the great weakness of increasing the average distance between their inhabitants.

The only solution to save a growing settlement from a slow death is a unidirectional growth which leads to a parabolic form, an ideal dynamic city or dynapolis (fig. 14e).

The process

Assuming that we have answered the questions of creation, growth and formation, we must decide on the process: what comes first and what follows. A process often used, especially for capital cities, is to start with the governmental buildings, the monumental areas and the high income dwellings. This process (fig. 15a) cannot lead to success for it is imperative that the lower income groups – those which *can build* a city – are settled first. If this is overlooked, the result is a composite settlement consisting of a central monumental part and several other non-co-ordinated areas, including several with slums (fig. 15b).

There is only one way to avoid this danger, and that is to follow the natural process of first building for the builders, who will then build the city (fig. 15c). This means proper conception and creative control of the overall development – not a negative attitude towards real needs, but full recognition that we must start by covering needs, and not by building monuments.
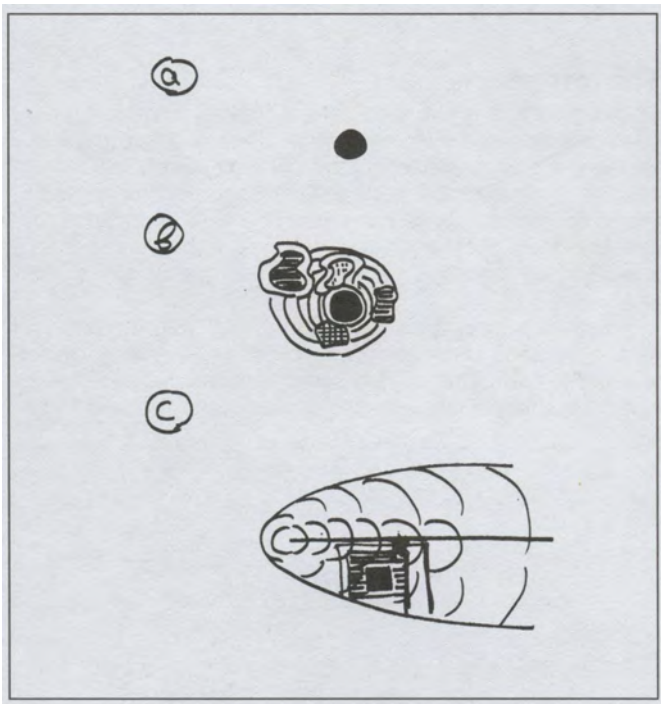
one-way road in this multi-dimensional subject. Every single aspect of it is conditioned by many others. Thus I will present several aspects of the question of 'what' kind of a capital is to be created without implying that the answer to the first problem necessarily leads to the solution of the second, for on many occasions all these answers had to be given simultaneously.

Size

The basic question of size has upset many efforts and led many new or existing cities to failure during the last few generations, as people's minds stuck to the old notion of a static city and they tried to specify its size. This has meaning for a small agricultural settlement or for a remote market town in a non-developing area. But, in all normal cases in our era of development, no size can be fixed unless it is a prediction for a certain given moment in time.

We cannot condition the size of Islamabad. It started with one inhabitant, the first man employed to observe climatological data day and night; then it reached the thousands; it is increasing to hundreds of thousands and will reach the millions; it is going to be linked with other settlements into major groupings and then move towards a population of tens of millions.

The only reasonable action in relation to size is the definition of a curve of probable population growth, which again must be continuously revised in order to allow the capital city to adjust to an evolving humanity in the area of its greatest

Fig. 15: The process.
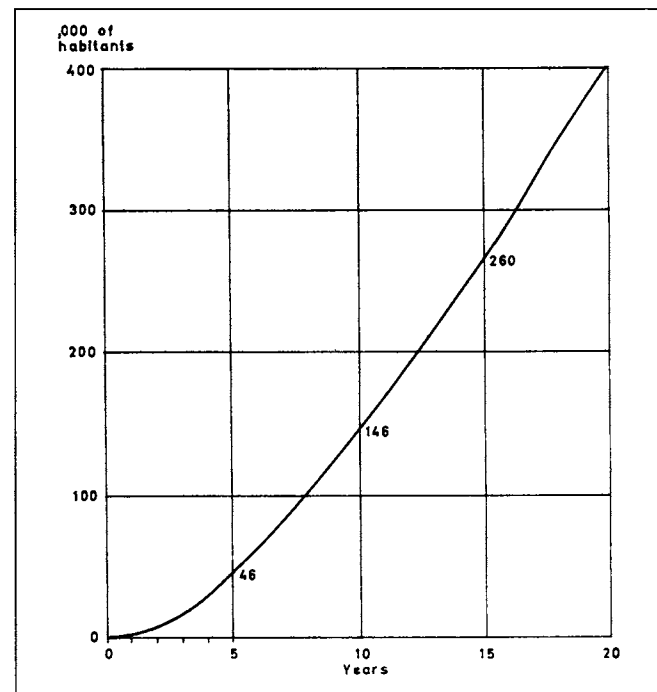
Fig. 16: Federal capital population increase.

What?

General considerations

We can now face the questions of 'what' we are going to create on the basis of our needs, the potentialities and possibilities presented by the previous analysis. As has already been explained, there is almost no chance of following a

development.

The curve of reasonable growth which was first planned and is now being implemented is shown in fig. 16. On the basis of this population curve we proceed to calculate the land required (fig. 17) and the corresponding investment (fig. 18). In any type of phenomena we cannot fix static dimensions but only curves of growth.

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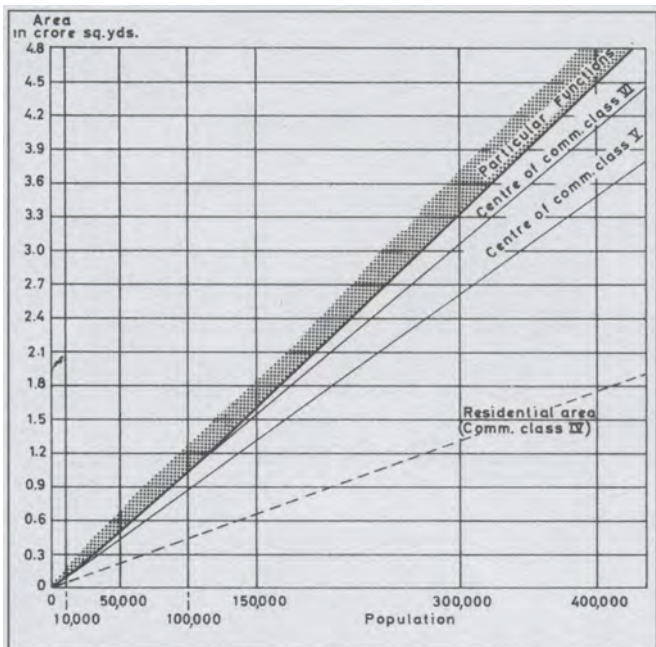
Fig. 17: Land required according to population size.

Note: one crore = ten million

£1 = 13.33 rupees (R)
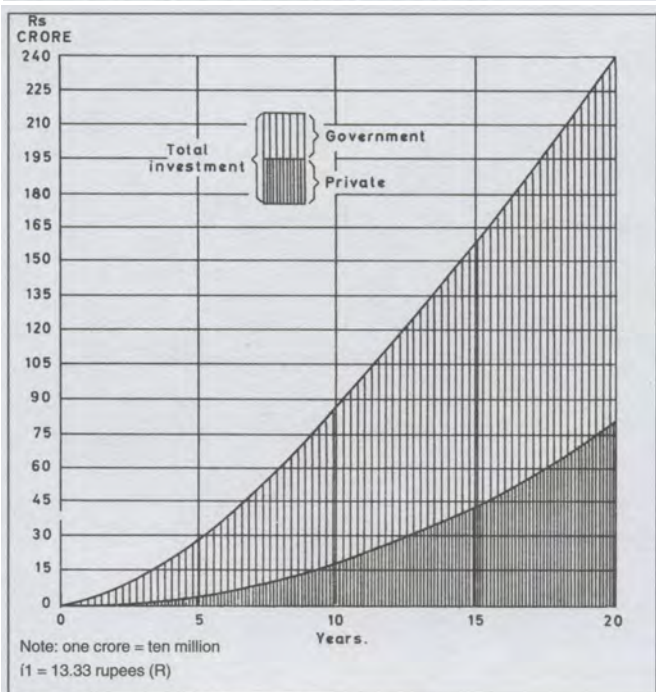
Fig. 18: Government and private investment.

Character

By explaining the proper attitude to the question of size, I have also indirectly answered the question of character. As the capital is going to grow continuously, it cannot be static, but must be dynamic, a *dynapolis* (fig. 19a).

Because it will be created near an existing city (fig. 12), it will be a *two-nuclei* dynapolis (fig. 19b), and because growth will be guided and uni-directional (fig. 14), the two nuclei will spread in space and form a dynamic metropolis (fig. 19c).

Thus Islamabad begins as a dynapolis fed by another nearby city, the city of Rawalpindi, will continue as a double dynapolis, will then merge with Rawalpindi into a dynamic metropolis, which will again become a part of the megalopolis along the Grand Trunk Road on the basis of the theory
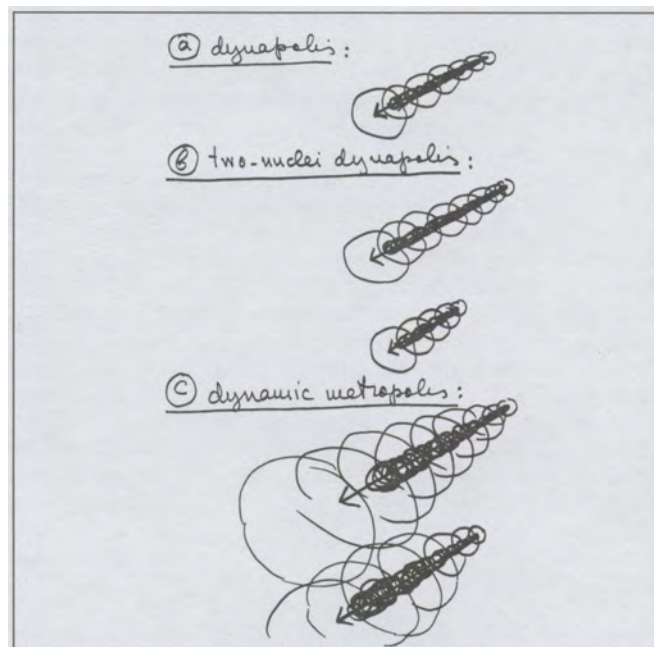
Fig. 19: Towards a dynamic metropolis.

which explains how our major settlements are led towards ecumenopolis.

We are now witnessing only the beginning of a process, and this fact conditions our role: which is to help this process to develop properly.

Basic form

The character of the capital also gives the first notion of its form. In dealing with a two-nuclei metropolis, we cannot envisage a linear form (fig. 20a); we will have to work with forms whose dimensions in two directions crossing each other at a right angle would not differ very much. By defining the character we can be led to the basic form of a concentric city with
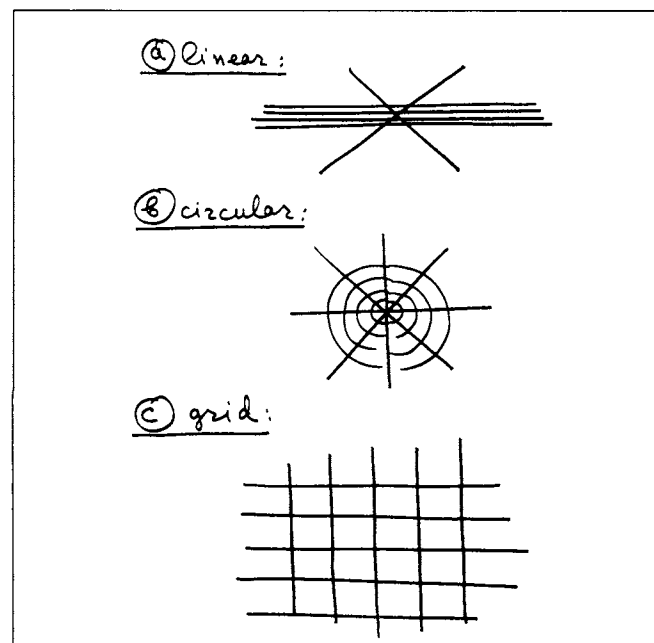
Fig. 20: Basic form.

a pattern of radial and circular streets (fig. 20b) – very similar to a naturally growing settlement – or to a pattern of a grid of streets crossing each other at right angles (fig. 20c).

Of these two, the circular one must be excluded, for it can fit a static city, but definitely not a growing one – and our capital must be the latter (fig. 14).

We are left with a grid, and the question arises as to which form this grid should have – the elongated city blocks of the past, square blocks, straight or curved streets? Various considerations show that the traditional elongated city block is a rational product of the fact that the block consists of plots which are in two rows of the same orientation (fig. 21a). There is no reason for the main roads to be curved, unless the form of the landscape compels us to do so. Only mechanical traffic leads to this solution, which may look naive but is genuine (fig. 21b). Thus we are led not only to the basic form of a grid, but also to the basic form of squares which by conception (of a grid of squares) are all equal; these are the cells of the city (fig. 21c).
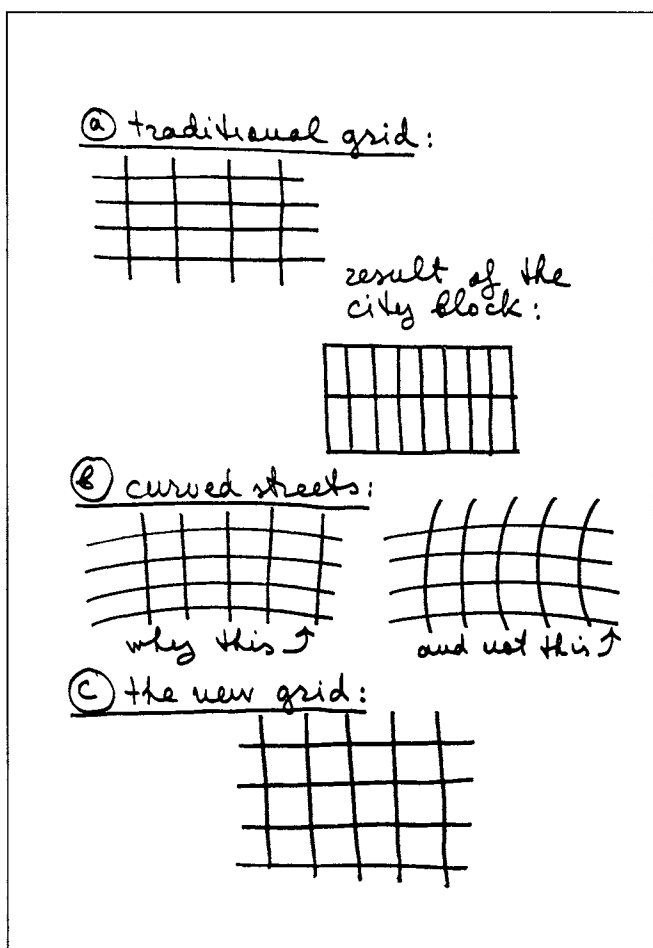
Fig. 21: The form of the grid.

And now back to history. It is here in the Indus basin that one of the first cities of man was created: Mohenjo Daro, with a typical rectangular grid (fig. 22a); and here we have the Moghul architecture – again based on a two-axial system (fig. 22b). Both present-day requirements and the cities of the past lead to the same conclusion: full respect for a geometric grid.

a. The forms of the past, Mohenjo-Daro, 2500-1500 B.C.

b. The forms of the past, Lahore Fort, 17th century A.D.
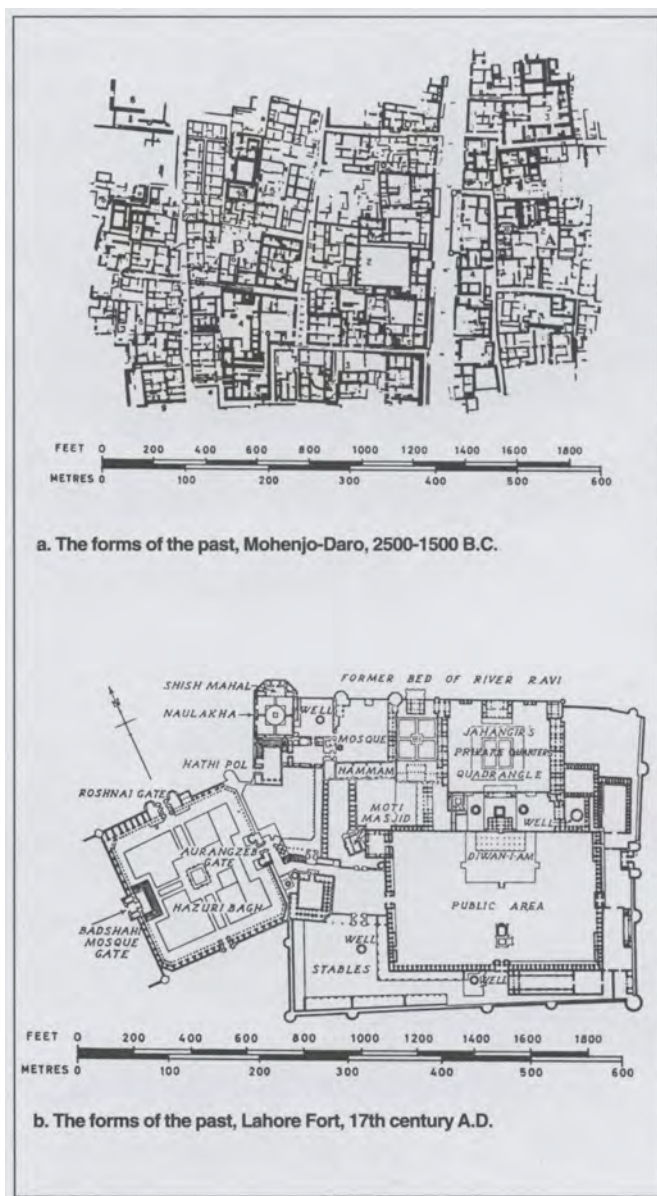
Fig. 22: Historic cases with full respect for a geometric grid.

Dimensions

Once we have defined the form of the grid, we must define its dimensions. This means defining the overall dimensions and the dimensions of the basic square – the modulus – which by continuous repetition will form the whole.

The overall dimensions are defined by the size of the city and the formation of the landscape; we do not know the former, but we do know that very soon the population will be in the hundreds of thousands, and we expect the metropolitan area to have reached the million mark within one generation's time.

We must conceive Islamabad as a dynamically growing settlement which will eventually have several million people. Its first planning phase should take into account a population of around two million people, a figure which could be reached in this century. Such a figure, and the one million forecast within a generation, show that the limitations of the overall dimensions will be drawn by the landscape. Actually, the phys-
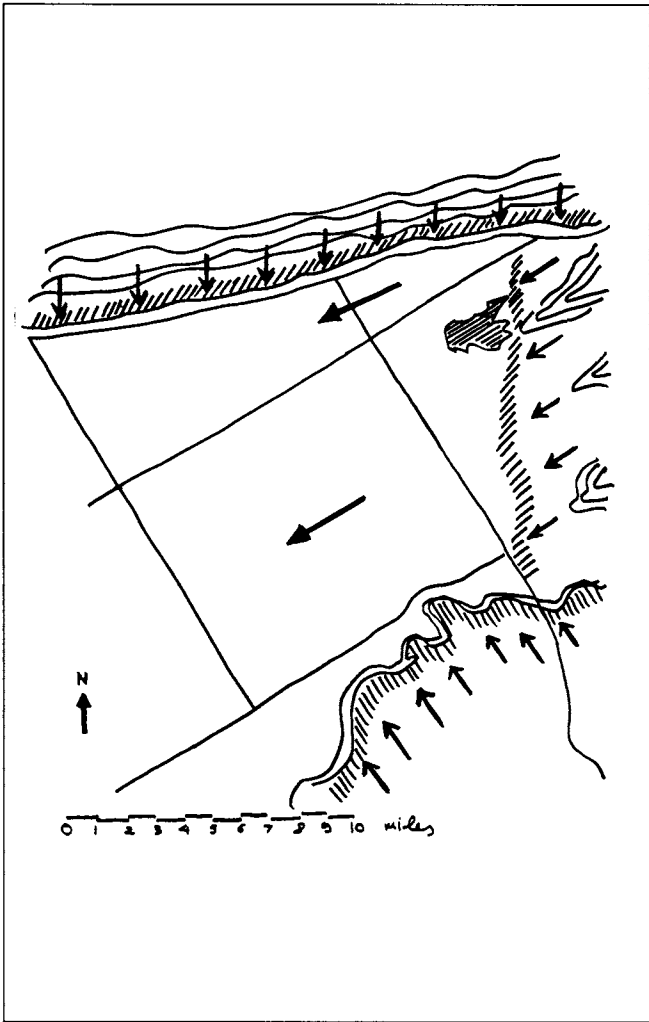
Fig. 23: Dimensions of landscape and metropolitan area.

Fig. 24: The moduli of the grid.

ical dimensions of Islamabad are defined by the container – closed to the North, the East and the South-East, and open to the South-West; this is ideal for a dynamic settlement, which requires uni-directional growth (fig. 23).

Given this container for the beginning of the life of our urban area, we must define its modulus. This is related to two forces, external and internal. The external forces are defined by the size of the whole. Given the fact that the size will be in the hundreds of thousands at the outset, we know that the city should be divided not into city blocks (fig. 24a), which are the moduli of the pedestrian city with several thousand people, but into sectors of such a size that the urban area can contain dozens of them (fig. 24b). But when the city reaches the million mark, even these sectors will be small as sub-divisions, and will have to be united by groups into major moduli (fig. 24c).

Another external force is afforded by the kind of mechanical transportation we use: we know that the distance between the lines of the grid depend on their accessibility, the speed allowed on them, etc. Taking all these factors into consideration, we are led to the conclusion that we need a grid which can form squares of different dimensions, depending on how many moduli we unite (fig. 25). The basic question, therefore, is the size of the smallest square of the grid.

Fig. 25: A multimoduli grid.
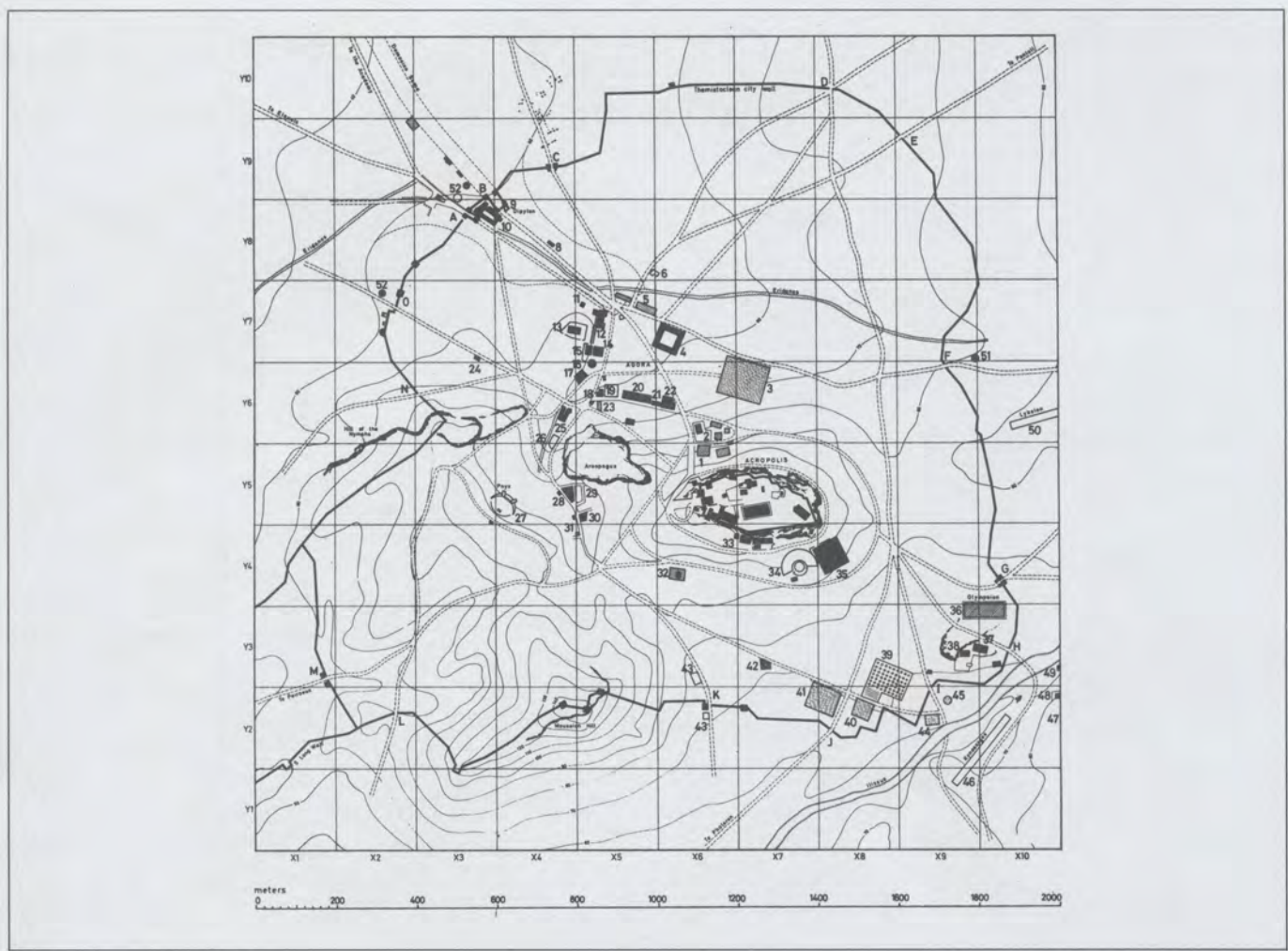
Fig. 26a: Athens.
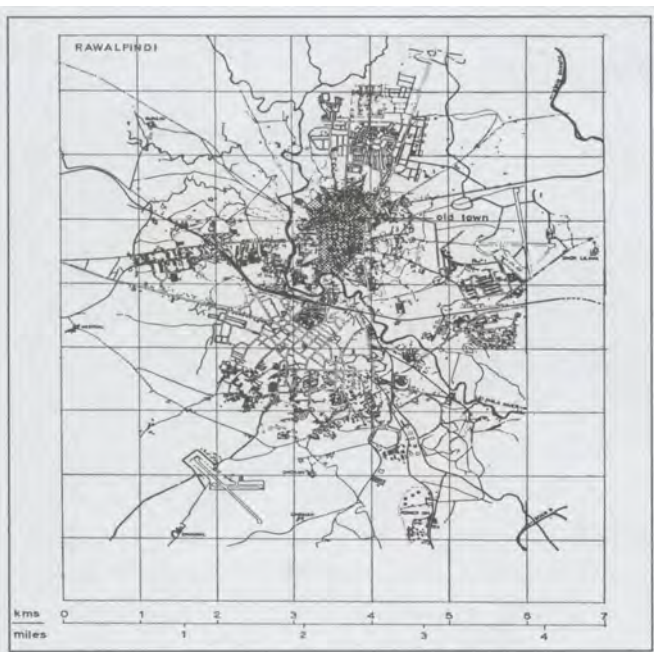
Fig. 26b: Rawalpindi.

This can be defined by the internal forces. Unlike the external forces, which are defined by machines, the internal forces are defined by man. And unlike the external froces, whose dimensions we have no precedent for, we have thousands of examples of internal forces: almost all cities that existed up to the eighteenth century. The lesson drawn from them is quite clear. The normal city, based solely on man's natural force, is a city whose dimensions are such that man can reach the centre without walking longer than ten minutes. If we go as far back as the ancient Greek city (fig. 26a) or to the nearest city in the neighbourhood of Islamabad (that is, to Rawalpindi, fig. 26b), the conclusion is the same – the longest distance is no more than 2000 yards or about 2000 meters. This is the modulus we are looking for, the square derived from the human scale (which now has some content) and from human tradition (five or six thousand years old) that is a square of about 2000 by 2000 yards.

On the basis of this we can now build our entire grid (figs. 27 and 28); a grid which, although consisting of static cells based on the human scale, can develop dynamically and unhindered into the future, into space and time.

In such a dynamic city we do not have a conflict of man and machine, we do not run the danger of moving in the vicious circle of the old city devouring its own self in order to grow (figs. 29-36).

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Fig. 27a: The metropolitan area of Islamabad.
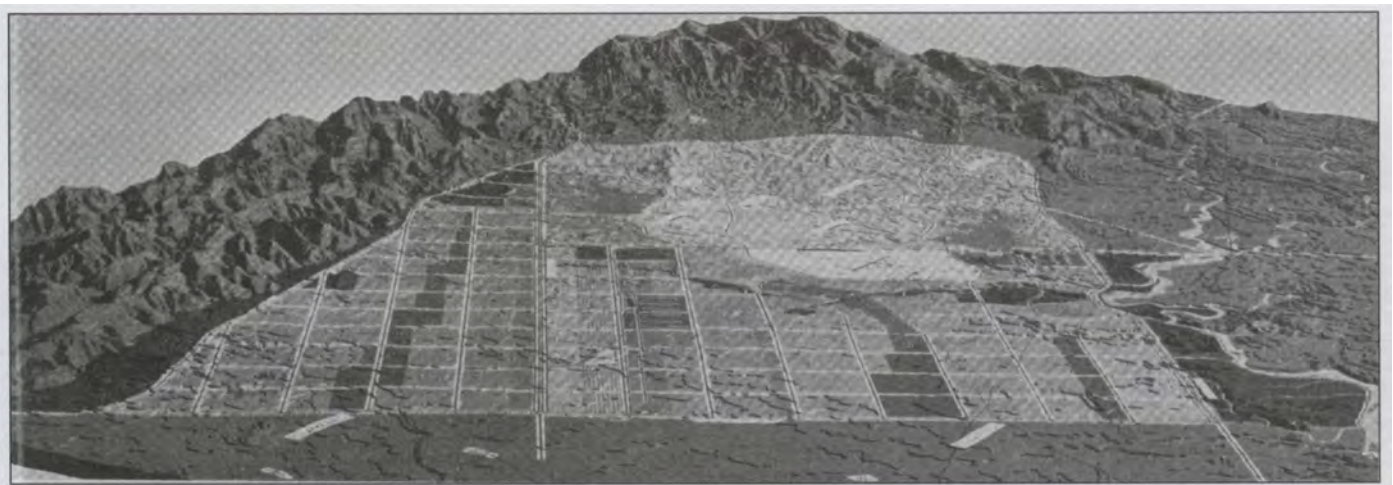
Fig. 27b: General view of the metropolitan area towards the east.
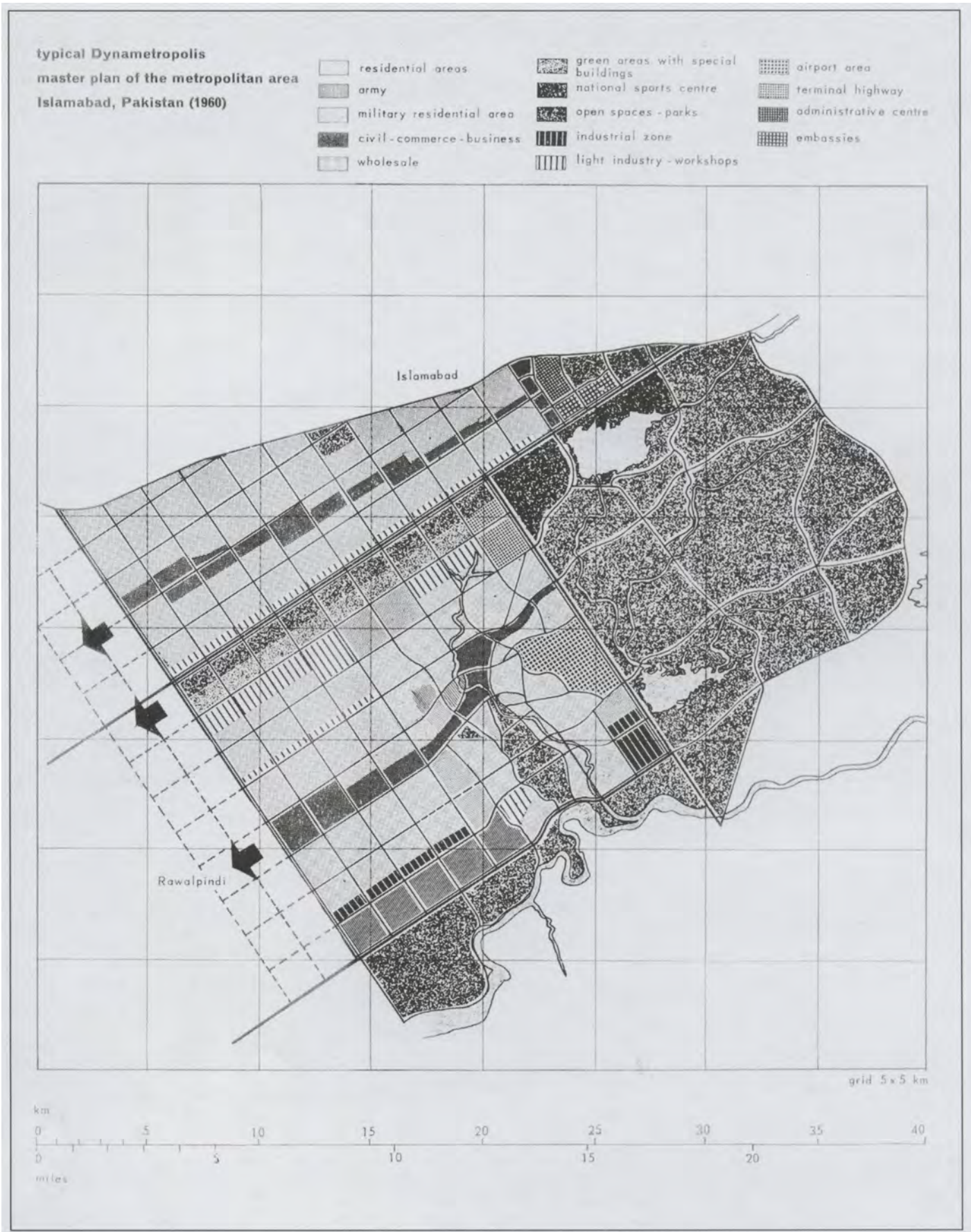
Fig. 28: The metropolitan area of Islamabad.
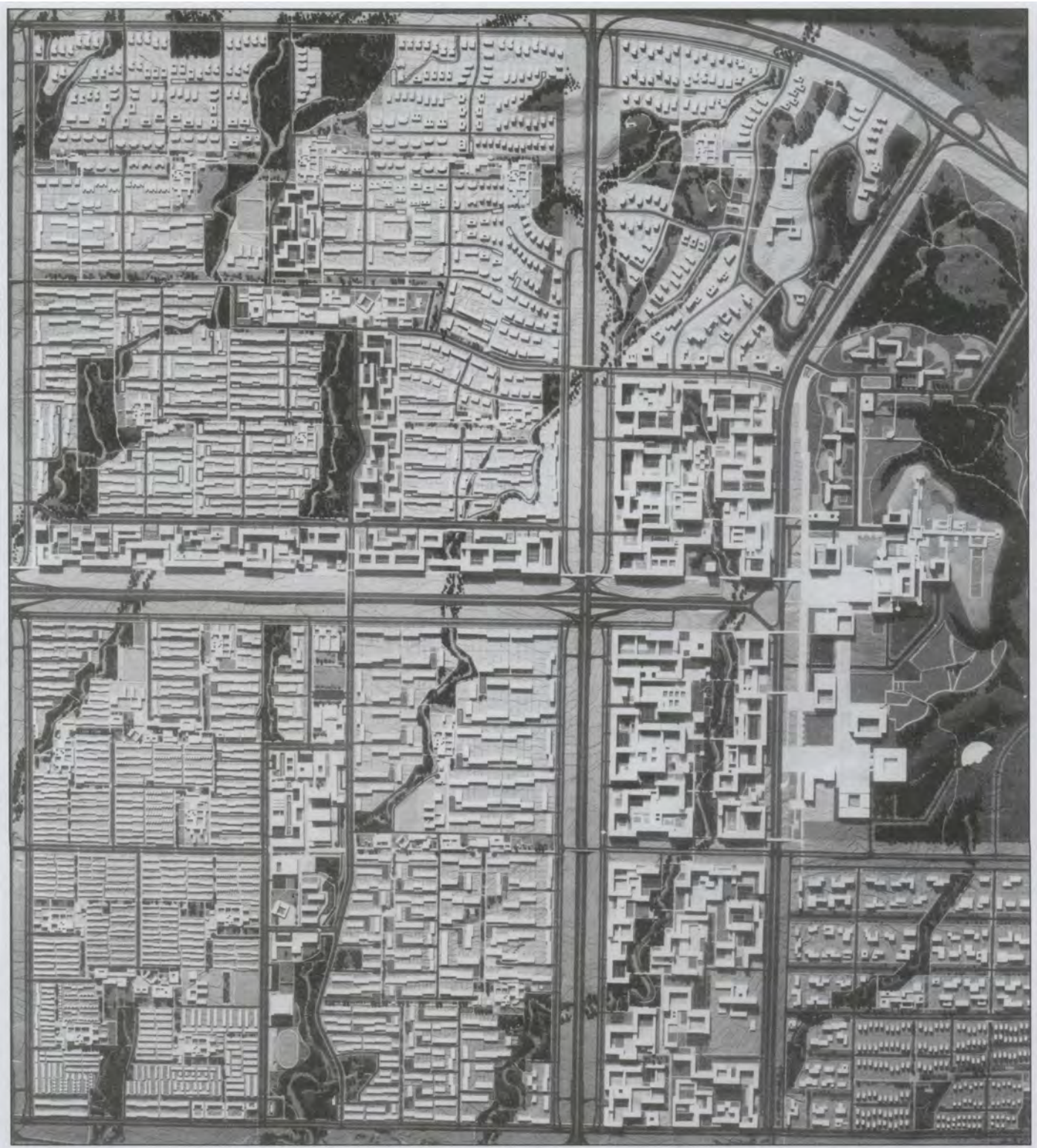
Fig. 29: Model of the central part of Islamabad consisting of the capital area (right centre) and the first two normal sectors-moduli (community class V).

Fig. 30: View of model along Capitol Avenue with the administrative centre in the background and the civic centre to the left of the avenue.
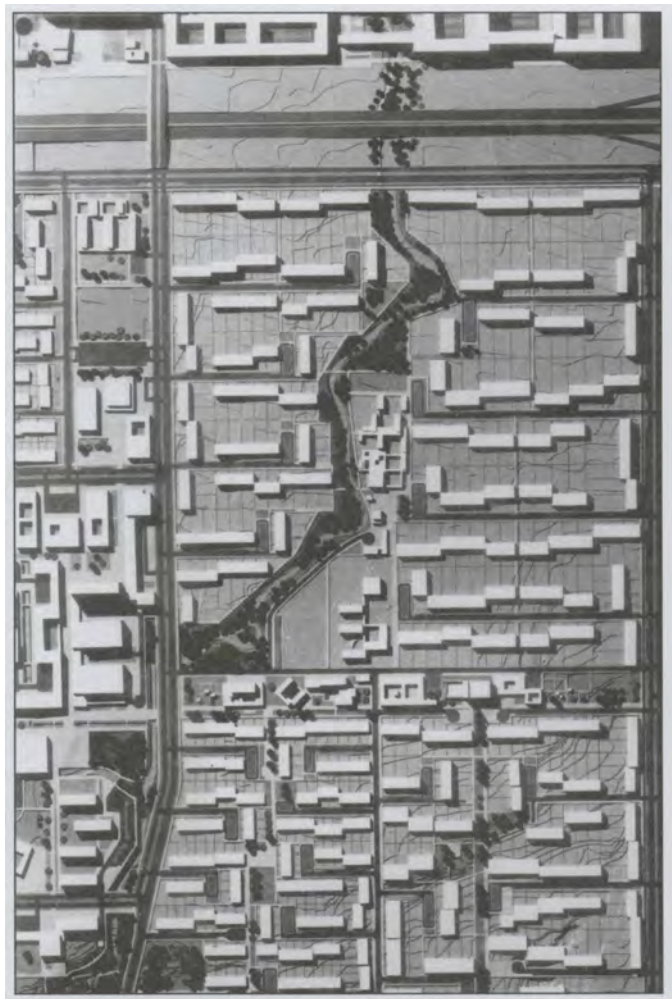
Fig. 31: Model of a community class sector G6.

Fig. 32: General view of sub-sector G6-14.

Fig. 33: Model of sub-sector G6-14.

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Fig. 34: Aerial photograph of two communities class V (Sectors G6-1 and G6-2).

Fig. 35: First community of lower income housing under construction.
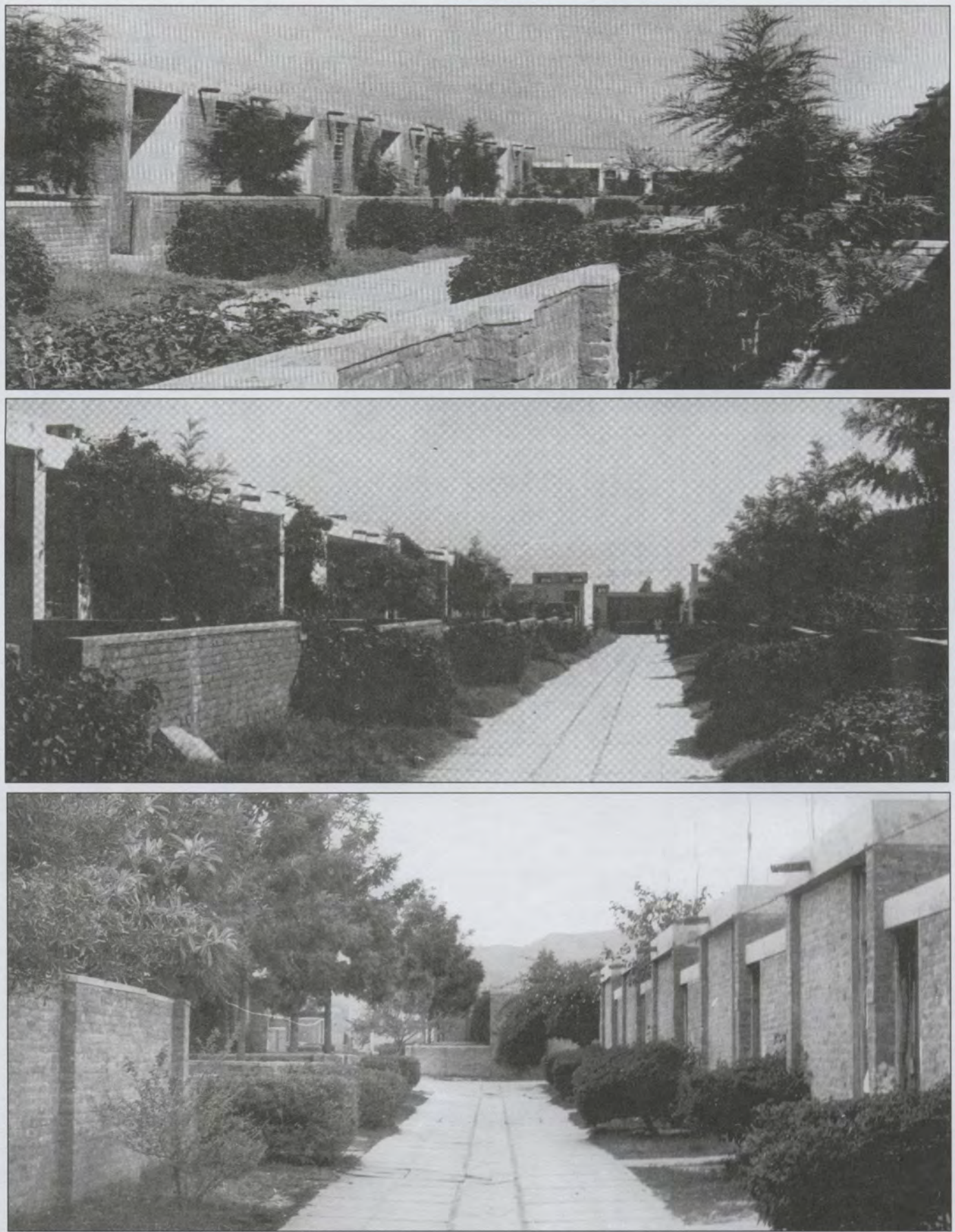
Fig. 36: Streets in communities for various income housing which are already inhabited.

Method for synthesis: The I.D.E.A. and C.I.D. methods

Introduction

After defining the frame which prepares the stage of synthesis we have to establish the process by which we will proceed from one stage to another in order to:

• cover the whole area in the proper time period;
• cover all aspects of our problem at the right time and at the right scale and details;
• create as tightly knit a system of answers to our problems as possible.

To achieve this we have developed the Isolation of Dimensions and Elimination of Alternatives (I.D.E.A.) Method, combined with the Continuously Increasing Dimensionality (C.I.D.) Method. This method had been under development for years, but was presented for the first time in 1966 when it was implemented in the study of the Developing Urban Detroit Area (UDA).

Before starting an analysis of the Method it is useful to point out that if the subject is small we may be able to cover it mainly by the isolation of several phenomena and the comparison of all possible alternatives. If the number of alternatives is large – which is the usual case – then a systematic approach for the gradual elimination of alternatives should be employed.

In order to make the I.D.E.A.-C.I.D. Method more easily understood I will present it not as a theoretical case, but as it was actually implemented in the Detroit project.

From the beginning of this study in 1964 it was recognised that the UDA suffered from the usual problems of having been studied in small pieces and for short periods of time; therefore only on the basis of the extrapolation of existing present trends. The only remedy for such a situation was to study the area on a scale large enough to include dynamic changes in the foreseeable future, in terms of both space and time. A preliminary study of how far the Urban Detroit Area could extend had indicated that it could cover a surface of 23,000 sq. miles, 200 miles from north to south and 150 miles from east to west, including 37 counties (25 in Michigan, nine in Ohio and three in Canada) (fig. 1). Beyond these limits the UDA could not expand as such since it would enter the urban areas of Chicago to the west and Cleveland-Pittsburgh to the east.

Fig. 1: Urban Detroit area.

The Urban Detroit Area has to be studied over several decades, since major projects sponsored by the Government or private industry are usually conceived many years before their implementation, and only prior physical planning can help towards their being conceived and implemented without the usual clashes between partial private plans which have been conceived early and general public plans which follow them at a time when commitments have already been undertaken by many decision-makers of urban development.

In order to attain the goals of this study we realised that we must proceed to the systematic conception of possible alternatives, then to their systematic evaluation and the elimination of those which were less satisfactory, and finally to the selection of the most suitable. To reach this end we had to *isolate* several phenomena in order of importance, at the phase and scale at which the examination was being made, and proceed by *eliminating* those solutions which were the weakest in relation to the phenomena selected. This method is the Isolation of Dimensions and Elimination of Alternatives Method or, the I.D.E.A. Method.

The application of this method makes it imperative that one start with phenomena of the greatest importance, and these are the ones which influence developments at the macro-

scale. This requires, therefore, continuous increase of the scale so that greater numbers of parameters or dimensions can enter into every successive step, and phenomena of a lower order can gradually be taken into consideration. This is the Continuously Increasing Dimensionality Method or, the C.I.D. Method.

The method for synthesis is based on the simultaneous application of both methods of Isolation of Dimensions and Elimination of Alternatives and Continuously Increasing Dimensionality (I.D.E.A.-C.I.D. Method), and the study is organised by steps in each of which we isolate phenomena and eliminate alternatives at the proper scale.

Each step is divided into two movements, as follows:
Movement 1:

Assumptions about the phenomena to be isolated which define the alternatives, that is the input into our system. Movement 2:

Criteria on the basis of which the alternatives that do not comply, or do not comply as well, with our goals can be eliminated, which leads to the output of the step.

The final output of every step becomes the input of the next one. The selection of phenomena, criteria and scales for every step is based on experience about their importance.

In the Detroit report we applied this method in eight steps and 16 movements, progressing from a theoretical number of tens of millions of alternatives to some tens, a few and finally one (fig. 2). Necessarily, since many assumptions had to be made about probable conditions and solutions based on de-

Figure 2 — Methodology:

49,000,000 ALTERNATIVES → A1

524,880 ALTERNATIVES → B1
10 ASSUMPTIONS FOR NETWORKS, 3 FOR SPEEDS, 3 FOR TRAVEL TIMES, 9 FOR URBAN CENTERS, 2 FOR EDUC.& RESEARCH CENTERS, 9 FOR INDUSTRY, 4 FOR PORTS ,9 FOR AIRPORTS.

11544 ALTERNATIVES → C1
16 ASSUMPTIONS FOR TRANSPORTATION SYSTEM 3 ASSUMPTIONS FOR MAX TRAVEL TIME 481 ASSUMPTIONS FOR COMBINATIONS OF LOCATIONS OF C.E.R.I.P A.

312 ALTERNATIVES → D1
5 FAMILIES OF ALTERNATIVES

DISTRIBUTION OF POPULATION IN :
40 ALTERNATIVES → E1
(POPULATION DISTRIBUTION MODEL ,BUILDING THE CITY) BASIC EMPLOYMENT. 7 FAMILIES OF ALTERNATIVES.

40 ALTERNATIVES → F1

DEFINING TRANSPORTATION CHARACTERISTICS IN :
7 ALTERNATIVES → G1

DEFINING COST CHARACTERISTICS IN:
7 ALTERNATIVES → H1

49,000,000 ALTERNATIVES (A2)
PHYSICAL FRAME FOR THE DEVELOPMENT OF UDA: a. NATURAL SETTING; b. NETWORKS,SPEEDS, MAX. TRAVEL TIMES; c. MAJOR FORCES OF ATTRACTION.
FIRST SERIES OF CRITERIA

524,880 ALTERNATIVES (B2)
TRANSPORTATION SYSTEMS PROXIMITY TO WATER. RELATION TO: URBAN AREAS, LANDWAYS; WATERWAYS, CONSISTENCY BETWEEN NETWORKS AND LOCATION OF FUNCTIONS.
SECOND SERIES OF CRITERIA

11544 ALTERNATIVES (C2)
RATING BASED ON FORCE MOBILE.
THIRD SERIES OF CRITERIA

312 ALTERNATIVES (D2)
SUFFICIENCY OF TRANSPORTATION NETWORKS. COMPATIBILITY OF TRANSPORTATION SYSTEMS AND TRAVEL TIMES. RELATIVE IMPORTANCE OF ALTERNATIVES BELONGING TO THE SAME FAMILY.
FOURTH SERIES OF CRITERIA

28 ALTERNATIVES (E2)
TRAVEL TIME, OVERALL, ACCESSIBILITY, POPULATION DISTRIBUTION AMONG MAJOR AND SECONDARY CENTERS, ETC.
FIFTH SERIES OF CRITERIA

7 ALTERN. (F2)
SCENIC ATTRACTIVENESS, TOPOGRAPHY CLIMATE, WATER SOURCES, ETC. URBAN STRUCTURE.
SIXTH SERIES OF CRITERIA

7 ALTERN. (G2)
TRANSPORTATION PRESSURES, PERSON FLOW DISTRIBUTION , ETC.
SEVENTH SERIES OF CRITERIA

1 ALTERN. (H2)
URBANIZATION COST
EIGHTH SERIES OF CRITERIA

I solation of
D imensions and
E limination of
A lternatives method

C ontinuously
I ncreasing
D imensionality method

Implementation of the IDEA method
In the Urban Detroit Area

Fig. 2: Methodology.

sirable goals, the implementation of this whole system has no finality at all. Decisions can only be taken by the population of the UDA; or in some cases by the administrations of the counties concerned, but the whole system does not need to change. If we feed in a new assumption at a certain step we will simply find some more corresponding alternatives and we will proceed with them. Because of similar considerations the last steps are even more indicative of how a final solution can be selected since, before this takes place, many decisions have to be made about basic assumptions of this study, such as the future lines of transportation of a high order, the creation of a new Urban Centre of a high order to relieve the pressures on the city of Detroit and allow it to develop properly, etc.

Simulation models

In order to facilitate the application of the I.D.E.A.-C.I.D., or in simpler terms, the I.D.E.A. Method, we need a number of models which allow for the simulation of situations under certain conditions, and the comparison and evaluation of several alternatives based on the assumptions made. Such models are sometimes very simple (as the models for the rating of basic functions in relation to other functions and localities) and can be studied on the basis of simple calculations; or are so complicated that they require the use of computers, such as the accessibility and comparison models which compare alternatives under varying local conditions.

All these models can be elaborated in very great detail and fed into computers. This is not necessary, however. On the contrary, in this early phase it was thought much more practical to proceed using alternately simple and detailed elaborated models in accordance with the actual needs and possibilities of each case, in each separate step. In any case we must be aware that every step of our work needs different types of models depending on the scale and dimensions we are using and the Ekistic unit we are dealing with. I find, for example, that it is almost ridiculous to use transportation models in too small communities where the traffic volume is very small.

The models used in this study are the following:
• Projections of urbanisation trends based on the change of land use from agricultural to urban.
• Projections of general growth trends.
• Projections of densities of habitation (residential densities).
• Projections of population distribution based on established trends.
• Force-mobile model.
• Population distribution model (several variations of the parameters entering were attempted – use of computer).
• Comparison models (of the various alternatives with local conditions – use of computer).
• Transportation models (use of computer).
• Cost models.
• Human community models.

In addition there is a necessity for the use of abstract models which can illustrate the impact of new forces on the existing structure and form. These can be very simple initially and become more elaborate in the more advanced phases. If, for example, we want to study the possible expansions of the settlement, assuming several alternatives for the location of the new central forces, we proceed as follows. We build tentative models showing several possibilities, such as the related problems for the centre, the arterial system, etc. (fig. 3) and conclude by the selection of the most reasonable alternatives which then have to be calculated carefully and compared with corresponding mathematical models.
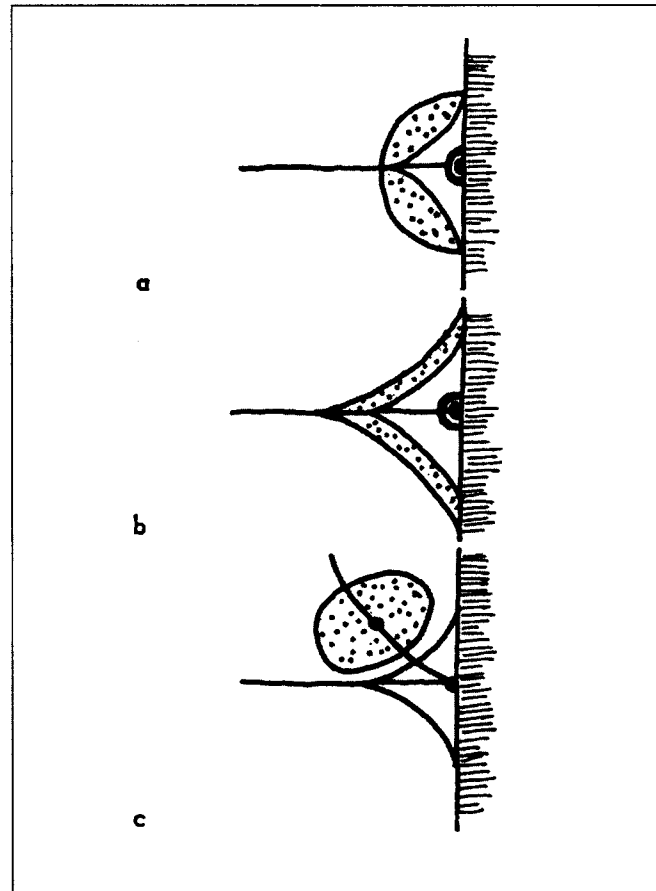
Fig. 3: Comparisons between several alternatives of dynamic growth.

Present and new trends

The next question that arises is how we can conceive future alternatives which can be compared in the different steps determined by the models to be used. The usual mistake is one of relying only on an extrapolation of existing trends. Because of forces inherent in all settlements, there is a certain course of development which is followed by the city itself. Unless major changes take place, this course is not expected to alter, and can be foreseen within reasonable limits of approximation.

Because of this, the conventional method of foreseeing and planning for the future is based on the extrapolation of present trends in an attempt to determine where the present course is leading. If this is done for such problems as transportation, it will result in the planning of new arteries to take care of the existing trends as they develop. Because of this approach, the new action taken in major cities tends to serve existing trends, and by doing so intensifies and stabilises them. Even if there was a natural tendency to change the present trends in some section of the city (because, for example, of the construction of a major factory in a different location) the opening of new arteries in accordance with the existing trends keeps development closer to the projected lines than it would have been otherwise.

It is quite clear that such a course leads to impossible situations. It would have been all right if existing trends were to lead to a better city, in which case it would have been reasonable to extrapolate existing trends. This, however, is not the case at all. On the contrary, experience has shown that existing trends create a snowballing process around existing cen-

tres of activities, existing axes of transportation, etc., and lead to congestion and paralysis.

We should use this method of extrapolation of present trends into the future as carefully as we can, not in order to show where we must go, but to find out *where we are going now* and what such trends will lead to. If the present trends are leading towards impossible situations, we must discover these situations, determine the dangers created for the city and the problems it will have to face in the future.

On the basis of these considerations we proceeded for the UDA to extrapolate the city's growth through expansion to the year 2000 by five different techniques. To do this we adapted existing models to the requirements of this study and developed new ones. The five techniques are as follows:

• *Projections based on urbanisation trends:* In order to define these trends we based our observations on the change in land-use from agricultural to urban, for which very good statistics were available. This was done because the change in land-use between the years 1900 and 1960, for which we have data every 10 years, allows us to derive an equation for the change which we subsequently applied to the whole study area as fig. 4 shows.

• *Projections based on general growth trends:* The trends in the participation of each county in the total population of UDA observed from 1930 to 1964 were projected in order to estimate future population distributions by county.

• *Projections based on residential densities:* By extrapolating the trends in density changes observed from 1940 to 1960 in a way that takes into consideration the observed facts that lower densities near urban centres tend to increase at a higher rate than high densities, as well as the effect of saturation limits, we obtained a picture of the future size and shape of the city in the form of iso-density contours (fig. 5).

• *Projections based on established trends:* Trends in the change of more composite phenomena were studied, such as facilities, transportation, densities in relation to local factors and saturation levels, etc. On this basis, ratings were given to the various localities in relation to their overall growth potential, and, assuming again that present trends will continue, the future distribution of population in the UDA was estimated by the extrapolation of these trends.

• *Projections by the population distribution model based on the concept of accessibility:* A computerised mathematical model using the concept of accessibility was developed for the distribution of population in the study area. We are not yet sure how well this model corresponds to the phenomena themselves, especially as regards their details, but the use of several types of accessibility models shows that in the projection of the basic phenomena about wider areas, we get a good simulation of reality (fig. 6).

Some of these methods lead to conclusions which are comparable. Thus, by comparing and combining the projections obtained by these techniques we came to conclusions about which parts of the projections are more valid.

A study of the results of these projections about the urban area to be created by the year 2000 if present trends continue, shows that Detroit which in 1960 had a population of 3,540,000 within its urbanised area, will have about 8,000,000 people in the year 2000. It is easily concluded that as the city of Detroit already has very great problems and difficulties in its central area it would be unreasonable to expect it to cope with future pressures exerted by 4,460,000 more people (an increase of 126 percent), which implies an even greater percentage increase in the number of cars, the movements of people and goods, etc.

The analysis of the continuation of the present course leads to the conclusion that it is most necessary to change it.
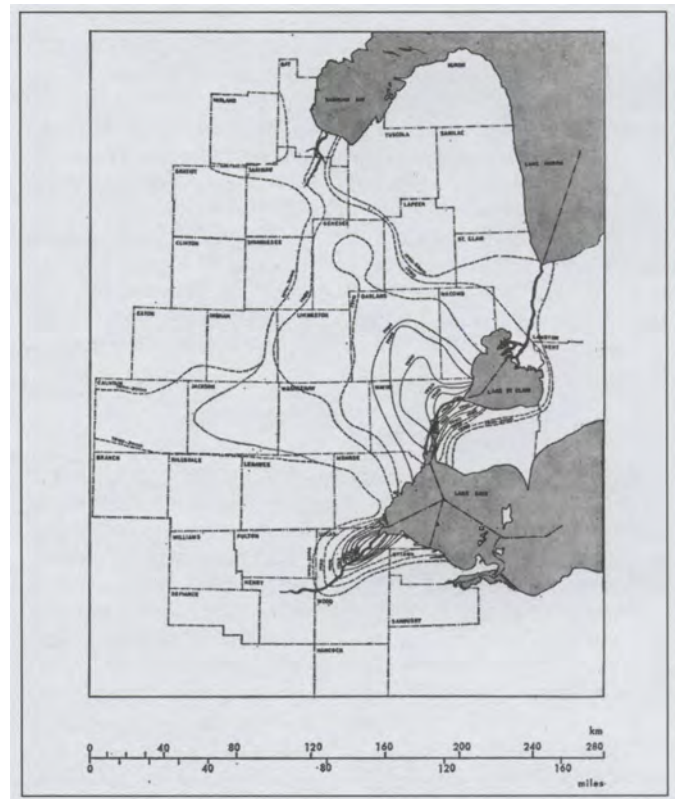
Fig. 4: Detroit area project – Expansion of area having more than 75 percent non-farm land from 1900 to 1959. Projections to years 1970, 1980 and 2000.
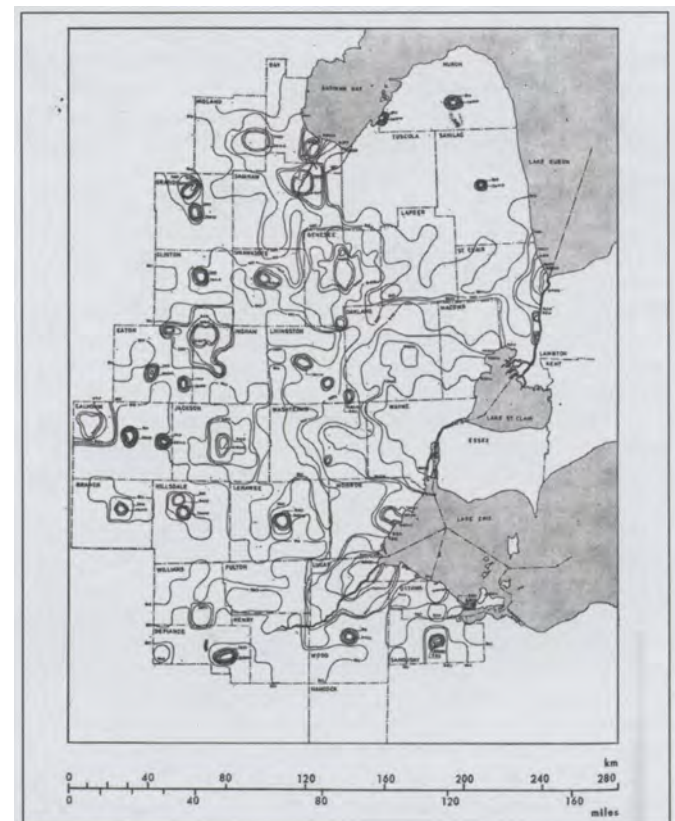
Fig. 5: Detroit area project – Estimated isodensity contours for the year 2000 corresponding to a total population in U.D.A. of 13,500,000 inhabitants.

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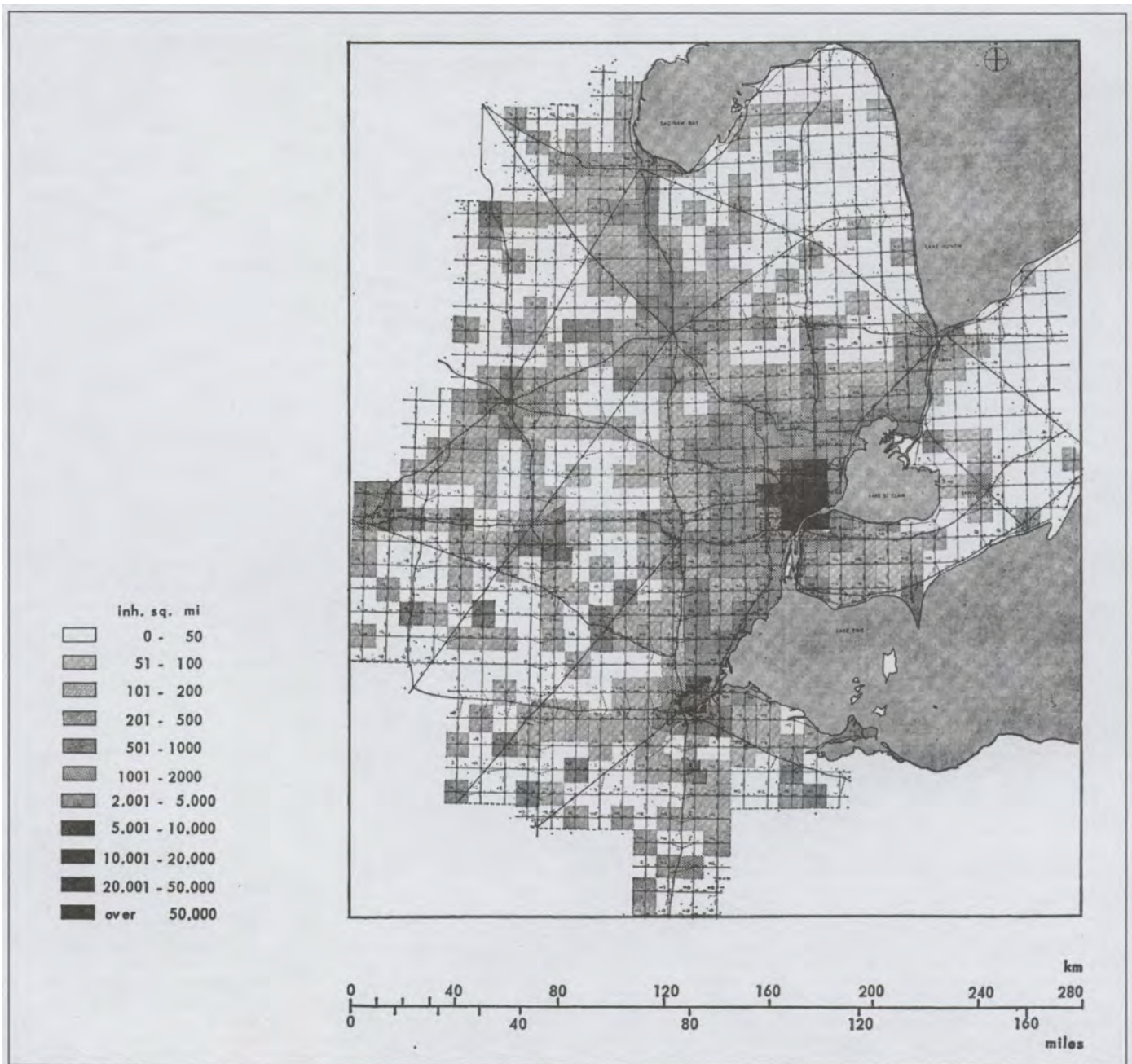
Fig. 6: Detroit area project – Population distribution by accessibility model for the year 2000
Single centre in Detroit – radial configuration of the higher order transportation networks
Speeds 100 and 250 m.p.h. – maximum travel time 30 minutes.

This is theoretically justified for all such urban areas, and specifically demonstrated for Detroit. In order to achieve this, goals must be set which can lead to a solution of the problems which make the present course unacceptable. These goals will have to be set further in the future and will define the desires for a better urban area which will avoid the weaknesses of the present and also the future towards which we are being led by present trends. As these goals will be set for a later date, in this case for the year 2000, it will be necessary to connect the situation defined by the future goals to the existing situation, in order to estimate how we can proceed from one to the other. We may, for example, desire a situation which is reasonable but not feasible for the target period of the study, or which may be unreasonable for any period.

We proceed by foreseeing alternatives and applying the Isolation of Dimensions and Elimination of Alternatives Method. We start with the question of how many alternatives there are about the future. If we consider that we want to base our alternatives on some basic assumptions about major urban centres, major industrial concentrations, major educational and research centres, major ports and airports and other important functions, as well as on different assumptions about population, densities of residence and work, transportation networks, speeds of transportation, maximum travel time and some other parameters, we shall have to estimate the number of alternatives that these basic assumptions create. If we present this in a theoretical matrix of possible alternatives, we will find that even if we accept ten alternatives for every one of the factors mentioned, we will be heading towards a total number of alternative combinations of the order of billions.

Implementation of the method

For practical purposes the process of evaluation and elimination started with an initial number of 49 million alternatives. This was a theoretical number corresponding to five assumptions for each basic parameter of the urban system (fig. 7).

In step A an effort was made to go from the theoretical thesis of five assumptions for each basic parameter to more meaningful ones. For example, as far as major functions are concerned, the consideration of the main transportation networks in the physical space of UDA led to the determination of the more important nodal points for their location. The number of assumptions referring to location of major functions was adjusted accordingly.

As far as parameters referring to people and their movements are concerned, a medium projection (equal to 15 million people by the year 2000), has been accepted for population; the study of the most probable patterns of communication networks, in combination with various sets of speeds, led to the acceptance of eight transportation networks; three variations of maximum travel time have been considered. Finally, densities have not been included in the parameters of the problem, because it was thought advisable to let the total human settlement acquire shape and texture corresponding to the assumptions made about functions and other parameters. Thus only a ceiling for densities is specified, leaving the decisions about them for future phases. The above assumptions and eliminations led to an output of 524,800 alternatives.

In step B the transportation networks were considered and those failing to satisfy a logical functional hierarchy were eliminated (fig. 8). The nodal points selected in step A for the location of major functions were further evaluated and the weakest among them were eliminated. The consistency between assumptions referring to Networks and assumptions referring to locations of major functions was critically examined and the inconsistent combinations, i.e. Networks with radial configuration coupled to locations of major functions determined from transportation lines of grid-iron configuration, were rejected. As a result, the number of alternatives was reduced to 11,544, which is the output of step B.

In step C the force-mobiles corresponding to the 11,544 alternatives were evaluated on the basis of a simple model used for the rating of groupings of major functions (fig. 9). This led to the selection of the 312 alternatives corresponding to the most reasonable force-mobiles.

In step D the surviving transportation networks were further evaluated and the weakest of them were eliminated because they were not considered sufficient for the proper servicing of the region. The compatibility of assumptions referring to maximum travel times with the assumed transportation systems were critically examined and the weakest combinations, as for example, high sets of speeds coupled to high travel times, were eliminated. Finally, families of alternatives with the same configuration of Networks and the same locations of major functions were considered, and the highest ranking group from each family as obtained from the force-mobile model was retained. The output of step D was 28 alternatives.

PARAMETERS OF PEOPLE		PARAMETERS OF FUNCTIONS																														
		URBAN CENTRES					MAJOR EDUCATIONAL AND RESEARCH CENTRES					INDUSTRIAL POLES					PORTS					AIRPORTS					OTHER FUNCTIONS				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
POPULATION	1																														
	2																														
	3																														
	4																														
	5																														
DENSITIES	1																														
	2																														
	3																														
	4																														
	5																														
TRANSPORTATION NETWORKS	1																														
	2																														
	3																														
	4																														
	5																														
SPEEDS OF TRANSPORTATION	1																														
	2																														
	3																														
	4																														
	5																														
MAX. TRAVEL TIME	1																														
	2																														
	3																														
	4																														
	5																														

This matrix which includes eleven types of parameters with 5 assumptions for each parameter leads to the conclusion that there are 49 million possible alternatives.

Fig. 7: Matrix of alternatives for the Urban Detroit Area.
Step A1: Input
49,000,000 alternatives

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Following considerations made in step A we reach an output of eight types of parameters (with two to nine assumptions for each parameter) which lead to a total of 524,880 alternatives.

Fig. 8: Matrix of alternatives for the Urban Detroit Area
Step A: Output and Step B: Input
524,880 alternatives

Following considerations made in step B we again reach an output of eight types of parameters but with a smaller number of values assumed for each parameter (two to eight) which lead to a total of 11,544 alternatives.

In the matrix C_0, C_1, C_2, C_3, indicate the location of the major urban centre C at the nodal points 0,1,2,3, respectively. The same method of notation is used for the alternate locations of the remaining major functions as well. Example : P_2 denotes the location of the major port P at the nodal point 2.

Fig. 9: Matrix of alternatives fo rthe Urban Detroit Area.
Step B: Output and step C: Input
11,544 alternatives

Fig. 10: Detroit area project population distribution by accessibility model for the year 2000. Twin centres in Port Huron Area - grid-iron configuration of the higher order transportation networks - speeds 60 and 100 m.p.h. - maximum travel time 45 minutes.

Fig. 11: Detroit area project population distribution by accessibility model for the year 2000. Twin centres in Toledo Area - grid-iron configuration of the higher order transportation networks - speeds 100 and 250 m.p.h. - maximum travel time 30 minutes.

Fig. 12: Detroit area project population distribution by accessibility model for the year 2000. Twin centres in Port Huron Area - grid-iron configuration of the higher order transportation networks - speeds 100 and 250 m.p.h. - maximum travel time 30 minutes.

In steps E and F a new dimension was introduced, i.e. the basic employment and its spatial distribution over the UDA, leading to an increase in the number of alternatives from 28 to 40. The total population assumed for the year 2000 was distributed by means of a mathematical model based on accessibility to employment, and the resulting population and density distribution patterns were evaluated. The evaluation took into account criteria based on the five Ekistic elements, i.e. Nature, Man, Society, Shells and Networks. Seven alternatives represent the output of these steps (figs. 10 and 11).

Steps G and H elaborated on the transportation and cost characteristics of the seven alternatives. Criteria such as pressures on the Central Business District of Detroit, cost of transportation networks, cost of urbanisation, etc., were used, leading to one alternative (fig. 12).

It may be asked how this method works for minor settlements, or for single shells. To answer this I will present the case of one auditorium. We must first define the required space. We may then find that this is larger than the scale permitted on the basis of economic criteria. The result may be a multi-level solution with balconies allowing us to respect all the assumptions and stand the test of all criteria. Such action

has to take place on a two-dimensional table such as the one on which every phase of the I.D.E.A. Method is based, a table presenting the action in the two movements of assumptions and evaluations, and the tests (fig. 13).

Fig. 13: Implementation of the I.D.E.A. and C.I.D. methods in an auditorium. One phase of our work.

C.A. Doxiadis during a press conference at Aspen, Colorado, 29 July, 1966, where he received the Aspen Award. (*Source:* © Constantinos A. Doxiadis Archives of the Constantinos and Emma Doxiadis Foundation).

Toward the implementation of the Concept-Plan

The text that follows is a slightly edited version of a document by C.A. Doxiadis extracted from Emergence and Growth of an Urban Region, *vol. 3: A Concept for Future Development (Detroit, Detroit Edison Co., 1970), pp. 359-388.*

Introduction

Now that the Concept-Plan for the Urban Detroit Area has been developed, how can it be implemented? What process can be initiated which will lead to its fulfillment? What action must be undertaken to face the full range of problems?

The purpose of this part is to indicate the process through which an urban area may move toward the solution of its problems and the implementation of the plans for its future development by acting at all scales, on all types of structures and functions, and in a coordinated way at the right time (fig. 1). To this end a series of essential programs are outlined for the complete physical reorganization of UDA (fig. 2). These programs would also initiate parallel efforts to resolve those problems which are not directly related to the physical structure. These essential programs are presented in terms of their basic targets and their basic dimensions, with indications as to who should undertake the responsibility for their implementation and coordination.

The Urban Detroit Area

The successful implementation of the overall Concept-Plan for UDA greatly depends on the selection of the key programs which will form its first phase. These programs are:

• Revitalization and remodeling of the existing central cities of UDA, particularly the Detroit Central City. This is not only necessary to relieve the suffering of many of their inhabitants but also to help the whole system acquire strong and adequately functioning centers and nodal points, an essential precondition for its successful reorganization (fig. 3).

• Creation of a new twin urban center northeast of Detroit where major functions will also be concentrated so that urban forces presently sprawling uncontrollably throughout the area can be channeled to take advantage of land and water transportation potentialities and of land uncommitted to urban development, thereby allowing proper planning and organization on the basis of present and future requirements.

• Creation of the east-west transportation axis of national and international importance north of Detroit. The growing Canadian population, the increased interaction between the United States and Canada, and the need for better connections among important urban centers of southern Michigan make this axis one of vital importance for the reorganization of the Urban Detroit Area. Also of great importance is the immediate reservation of rights-of-way for the other axes of the entire regional transportation system in order to ensure the basic
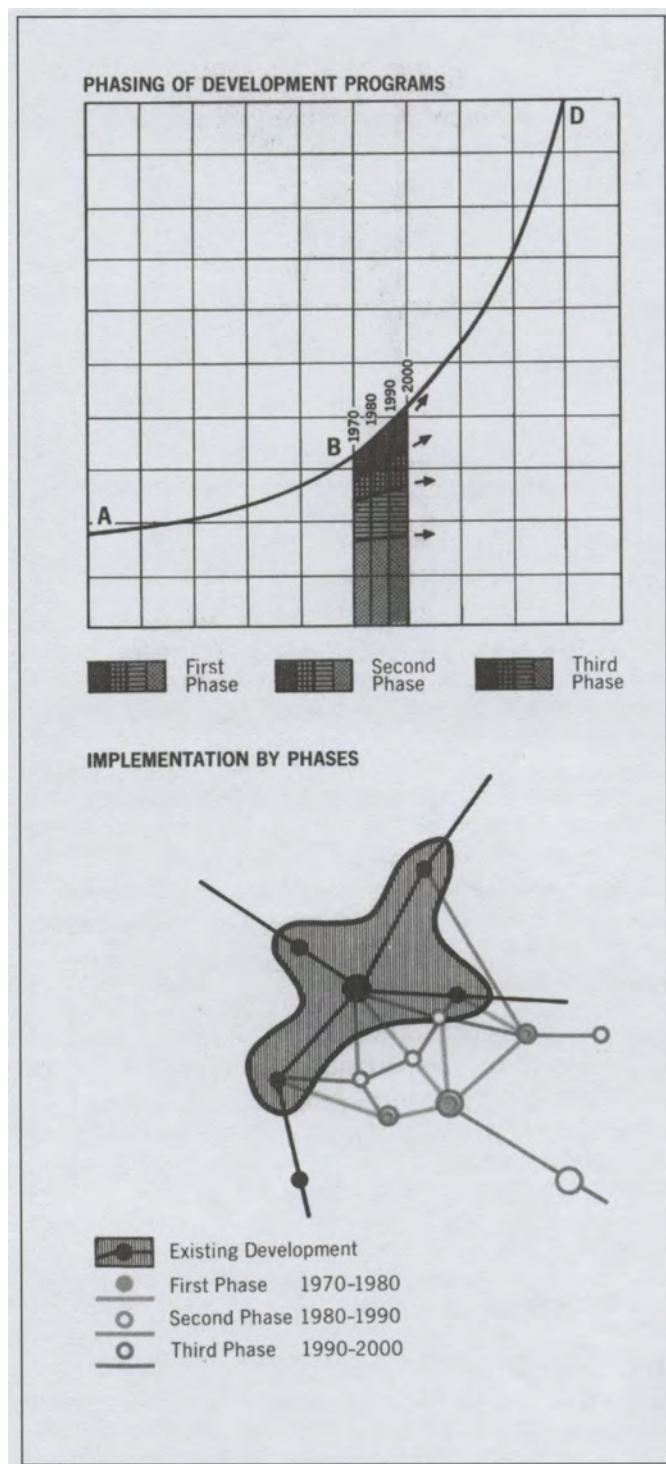
Figs. 1 and 2: The process of implementation.

Fig. 3: Implementation of the Concept-Plan at the UDA scale.

ment related plans in the Central Region. If, however, the implementation of the basic elements of the overall plan starts early enough, action in the Central Region will then have to concentrate simultaneously on those parts which suffer most, i.e., the Detroit Central City and its CBD, as well as those areas proposed as new centers of activity within or close to existing urbanized areas.

The most important of these centers is the new major urban center, conceived as a twin to Detroit and located northeast of it in St. Clair County. Action for the creation of this center should be focused during the first phase on its industrial areas, port and airport facilities, CBD and land connections with Detroit. Such action must also be clearly coordinated with the creation of the major east-west axis which constitutes the spine of the new center (fig. 4).
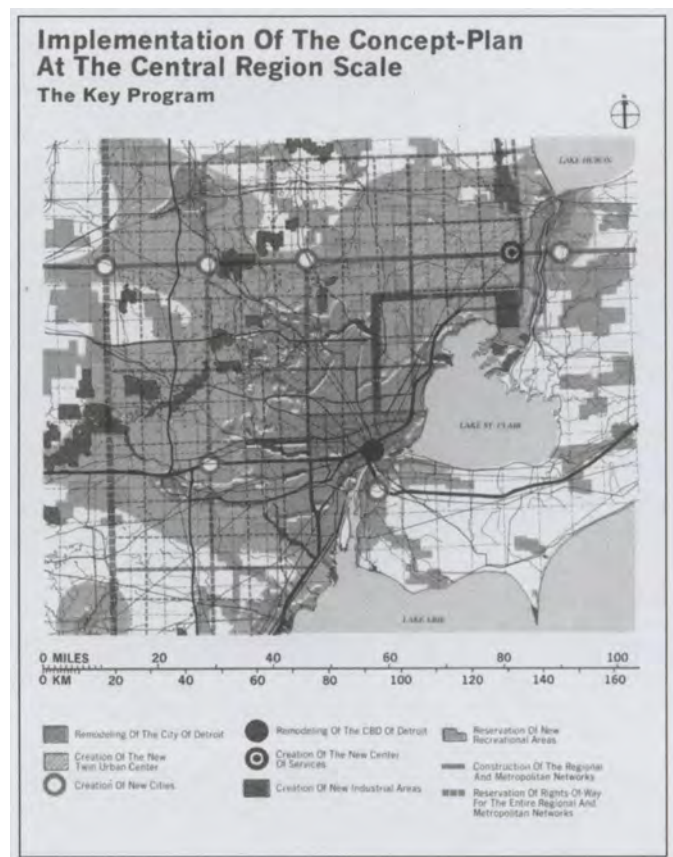
Fig. 4: Implementation of the Concept-Plan at the central region scale.

framework for all future developments.

• Creation of a number of new cities strategically located throughout UDA as new nodal points of the system to reinforce and organize the development of the existing metropolitan centers and to create new poles of attraction for additional development in UDA.

• Reservation of adequate land for a network of recreational facilities throughout UDA to cover the increasing needs of the present and particularly the future population and to ensure a better natural environment.

Successful implementation of such important programs requires that they be broken down into the following three categories:

• Programs of emergency not necessarily related to the physical structure. These are imperative in order to help those citizens who are suffering the most and to establish a balance in the whole system, two conditions which are necessary for growth and proper development.

• Programs of therapy and change in the highly urbanized areas where the greatest problems of physical structure and inadequate functioning are concentrated at present.

• Programs of growth and change referring to new developments, including new communities and new cities in the outlying areas, which will lay the structural foundations for better future development and a better quality of urban life.

The central region

Action in the Central Region depends on the implementation of the overall Concept-Plan for UDA. If key programs such as major land transportation axes, new centers, airports, ports, etc., are not initiated in time it will be very difficult to imple-

In addition, action should also concentrate on the creation of those new cities proposed by the Concept-Plan in the vicinity of Detroit and its twin urban center. This action has to be coordinated with programs to reserve the land required for all regional and metropolitan transportation corridors provided by the Concept-Plan, as well as for the regional and metropolitan recreational areas which surround and penetrate the Central Region.

The Detroit Central City

In the Detroit Central City implementation has to move in several directions. Assuming parallel implementation of the basic elements of the Concept-Plan at larger scales, the effort within the city should aim at its revitalization and complete remod-

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eling on the basis of targets for population and employment which have been set by the Concept-Plan. To this end, programs to achieve the following should be initiated (fig. 5):

• Reorganization of the Detroit Central Functions Area on the basis of the Concept-Plan.
• Creation of a new system of land transportation connections between the Detroit Central City and other parts of the Central Region and the new twin urban center in St. Clair County.
• Reorganization of the internal structure of the Detroit Central City on the basis of a new system of transportation axes and corridors, and self-contained residential communities.
• Creation of subregional and local centers to serve the new structure and the proposed system of communities by strengthening existing centers and creating new ones.
• Improvement of the natural environment through land reservation and the development of a network of recreational areas.

The Central Business District of Detroit

In parallel with the above objectives, key programs should be initiated in the center of the whole system – the CBD of Detroit and its extension into the Central Functions Area. On the basis of the Concept-Plan the initial effort should be directed as follows (fig. 6):

• Reorganization of the internal structure of the center through a rearrangement of its basic uses and functions and its system of vehicular traffic, and through the creation of superblocks.

• Creation of a two-level system for the complete separation of pedestrian movements from vehicular traffic along a network of major pedestrian corridors.

• Elimination of open parking lots in order to reestablish the continuity of the center and to improve its safety, security and aesthetic appearance. In the first phase this can be achieved through the creation of attractive walls around the open lots. The long-range target, however, will be to locate all existing and new parking facilities in multilevel garages and under the pedestrian corridors.

• Creation of a new low-speed system for internal circulation in the Central Functions Area starting from its most important part: the existing CBD.

• Immediate remodeling of the existing residential areas within the Central Functions Area combined with an effort to encourage the development of new areas in order to assure the vitality of the center even after working hours.

The process of implementation

General

The continuing process of implementation should be based on well-conceived and coordinated programs of action. The overall objective of these programs should be to gradually eliminate all problem areas in UDA and to serve the existing needs, as well as those expected for the future due to anticipated new urban forces.

These programs should aim, therefore, at two goals: to implement the elements of physical structure, as these are derived from the proposals of the Concept-Plan; and, at the same time, to attack the other problem areas where solutions do not entirely depend on the implementation of the elements of physical structure.

The analysis made by this study has identified a total of 40 main problem areas and needs. A successful process of implementation should, on the basis of the above, cover all
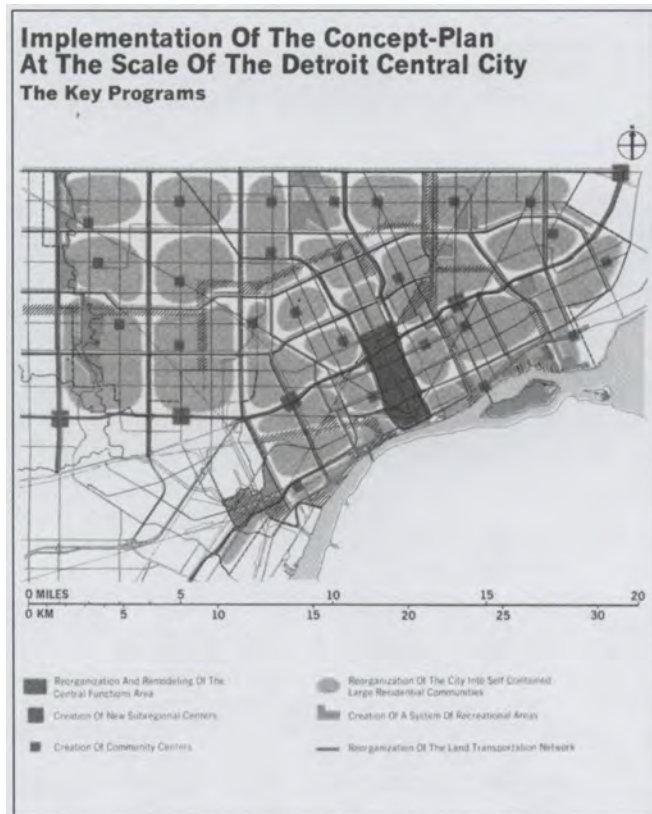
Fig. 5: Implementation of the Concept-Plan at the scale of the Detroit central city.
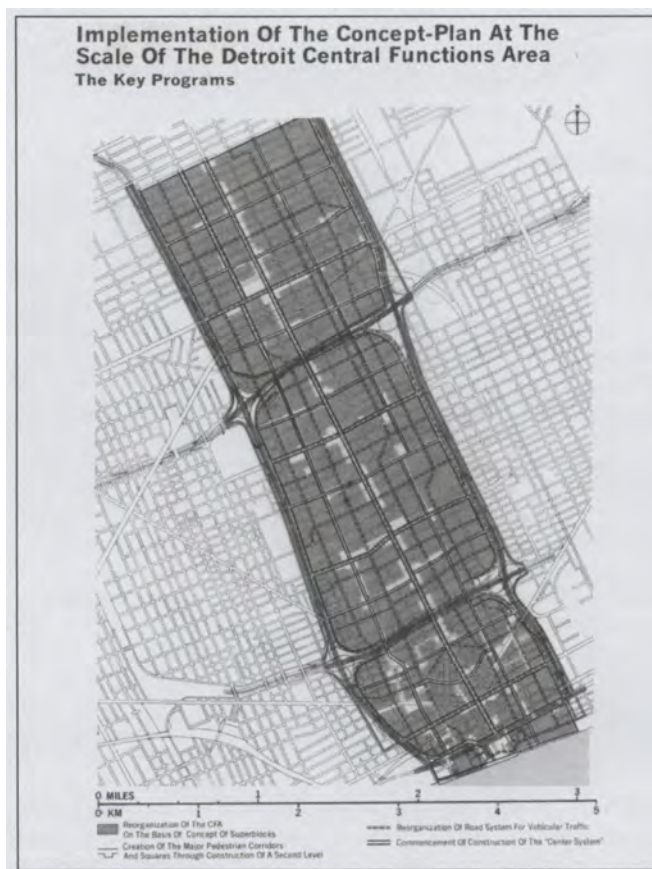
Fig. 6: Implementation of the Concept-Plan at the scale of the Detroit functions area.

these problem areas with corresponding programs of action, meeting these problems wherever they exist, at every scale of study and at all units.

This part presents a first outline of the 40 programs on which the process of implementation can be based. It would of course be presumptuous, at this stage, to attempt to resolve all aspects related to implementation. Instead, it is necessary to initiate a dialogue by presenting the basic concepts and characteristics of each program. Although programs related to the elements of physical structure are presented in more detail, further study and elaboration will be required in all cases in order to illuminate all aspects related to each individual program as well as to those concerned primarily with the interrelation and coordination of these individual programs.

From problems to Concept-Plan

The analysis of existing conditions has identified 40 main problem areas which affect all or some of the scales of study. The selected alternative, in its first elaborated form, was studied in relation to these 40 problem areas and it was found that this alternative could provide the basis for the partial or complete solution of 33 of these problems. Through a rating system which evaluated the extent of contribution of the selected alternative toward the resolution of the problems, it was found that the selected alternative could cover a total of 36 points, or 30 percent of a maximum of 120 points corresponding to the complete solution of all problems at all scales.

Then the study proceeded to the elaboration of the Concept-Plan at various scales. Again the Concept-Plan was related to the 40 problem areas and it was found that the contribution toward the solution of problems increased significantly. Thus the implementation of the Concept-Plan can contribute to the partial or complete solution of a total of 37 problems. Through the same rating system it was found that the extent of the Concept-Plan's contribution could reach a total of 63 points, or more than half of a maximum of 120.

From Concept-Plan to programs of action

The realization of the Concept-Plan will provide the basis for the solution of the greatest part of the problems and needs of UDA. A successful implementation, however, should aim at covering all problems at all scales. In order to do so, this study suggests the initiation of one program for each particular problem, i.e., a total of 40 programs corresponding to the 40 problem areas. In many cases, of course, a particular problem may not be completely met by the implementation of the corresponding program because its solution will also depend on the implementation of parallel programs. The meaning, therefore, of the correspondence between programs and problems is that each main program is the most important tool for the solution of the corresponding problem, though it may not in itself provide for its complete solution. Thus the interrelation, interdependence and coordination among the programs become of paramount importance for a successful implementation.

Each program specifies certain actions which need to be taken at various scales. These actions vary in the length of time needed to attain their objectives and could, therefore, be grouped in three categories based on whether their objective is to have an immediate impact on the respective problem areas, which is a short-term endeavor; whether it is to create change and provide measures of therapy for existing suffering areas, which is a medium-term endeavor; or finally, whether it is to create change and growth in existing and new areas, which is a long-term endeavor. If most of the actions of a given program come under any one of the above cate-

gories, then the whole program may be considered as belonging to this category. Figure 7 shows what kind of action should be primarily taken under each of the 40 programs at the various scales.

In the first category are actions with a primary aim of *Immediate Impact* on the problem areas. The emphasis here is on problems which affect people directly and require action which can produce benefits almost immediately. Most programs in this category deal with problems deriving from economic and social conditions such as inadequate education and economic segregation. In those cases where immediate relief is needed for problems related to the physical structure of the city, such as poor housing conditions, lack of community organization, etc., action under this program would refer to first-aid measures which need not be delayed by physical planning and remodeling. Action in this category cannot provide a complete solution to the problems involved; its purpose is to relieve human distress quickly and emphatically, though this may be only temporary or partial relief, in ways compatible with longer term programs which will gradually provide the final solution.

Complete solutions to problems can only be provided through action under the second and third categories. The second category of *Change and Therapy* aims at resolving problems of the most acute nature, mostly found in the central parts of the existing urban areas. These programs, therefore, reinforce action on all problem areas found in the first category, but they extend also to other problem areas which cannot or need not be temporarily relieved with measures of the first category. Such additional problems are mostly related to the economic structure of the area or to demography. In terms of time, the actions proposed by programs of this category are usually of a medium range.

The third category refers to *Growth and Change*. Action under this category would pertain to the new developments and new areas of growth as provided by the Concept-Plan. The goal would be to create an effective and efficient urban system by directing growth and change in order to prevent the problems now affecting city centers from spreading over large areas of the urban systems of UDA. Preventive action under this category would attempt to maximize the natural advantages of new areas of growth, reverse the trends of decline threatening the urbanized areas and create a well-functioning system based on new directions of growth which could result in positive changes for the whole region. This will necessarily be a long-term effort and will call for the new physical infrastructure as proposed by the Concept-Plan: the new major twin urban center, the new cities and the new transportation system.

Finally, there is a small number of programs which do not fall under any of the above categories and could be classified as *General*. Action under this category would look into the more distant future and endeavor to lay the foundations for the better development of the whole area and contribute to the elimination of human and physical problems mainly through institutional and organizational measures.

Of the 40 problem areas considered, 15 require action for immediate impact, 29 require change and therapy, 34 require growth and change, and 5 require general action which will provide the institutional and organizational framework for all problems (fig. 7). Actions of the first and second categories are generally related to the smaller scales of study up to the scale of the cities. Actions of the third category are related to the larger scales, from the scale of cities and above. The fourth category covers all scales from the scale of neighborhood to that of Great Lakes megalopolis.

Categories Of Action Under Each Program

MAIN PROBLEMS & NEEDS		EKISTIC UNITS → DESIGNATION OF UNITS (1 MAN, 2 ROOM, 3 DWELLING, 4 DWELLING GROUP, 5 SMALL NEIGHBORHOOD, 6 NEIGHBORHOOD, 7 SMALL TOWN, 8 TOWN, 9 LARGE CITY, 10 METROPOLIS, 11 CONURBATION, 12 MEGALOPOLIS, 13 URBAN REGION, 14 URBANIZED CONTINENT, 15 ECUMENOPOLIS) — COMMUNITY CLASS I–XII (V CBD's, VI CITIES, VII SUB-REGIONS, VIII UDA, IX GLM, X USA AND CANADA)	PROBLEMS ENCOUNTERED BY VARIOUS CATEGORIES OF ACTION

NATURE — Natural Environment
- N1 UNFAVORABLE CLIMATE IN GLM
- N2 DESPOLIATION OF LAND RESOURCES AT ALL SCALES
- N3 LACK OF RECREATIONAL AREAS AT ALL SCALES
- N4 POLLUTION OF WATER AT ALL SCALES
- N5 POLLUTION OF AIR AT ALL SCALES

MAN — Demography
- M1 GROWTH RATES IN GLM AND UDA FALLING BELOW NATIONAL AVERAGE
- M2 DECLINING GROWTH RATE IN CENTRAL REGION
- M3 DECLINING POPULATION IN CENTRAL AREAS

SOCIETY — Socio-Economic Structure
- S1 HIGH RELIANCE OF UDA ECONOMY ON A SINGLE SECTOR
- S2 UNDERDEVELOPED SERVICES SECTOR IN UDA
- S3 LOW PERCENTAGE OF WHITE COLLAR WORKERS IN UDA
- S4 LOW EDUCATIONAL ATTAINMENT IN CENTRAL REGION
- S5 DECLINE OF INCOME IN CENTRAL AREAS
- S6 DECLINE OF RETAIL SALES IN CENTRAL AREAS
- S7 DECLINE OF OTHER ECONOMIC ACTIVITIES IN CENTRAL AREAS
- S8 DECLINE OF TAX BASE IN CENTRAL AREAS
- S9 ECONOMIC SEGREGATION
- S10 RACIAL SEGREGATION
- S11 INCREASING GAP OF CHOICES BETWEEN GROUPS OF PEOPLE
- S12 SEGREGATION OF AGE GROUPS IN CFA
- S13 OTHER PROBLEMS OF SOCIAL IMPORTANCE

NETWORKS — Physical Structure
- P1 NEED TO COORDINATE UDA'S LAND CONNECTIONS WITH ITS WIDER REGION
- P2 NEED TO COORDINATE UDA'S UTILITY NETWORKS WITH THOSE OF THE WIDER REGION
- P3 NEED FOR BETTER CONNECTION OF WESTERN MICHIGAN AND THE UPPER PENINSULA WITH UDA
- P4 LIMITED DEVELOPMENT OF WATER TRANSPORTATION
- P5 INADEQUATE FACILITIES TO MEET NEW DEMANDS OF AIR TRANSPORTATION
- P6 NEED FOR NEW ORGANIZATION FOR THE LAND TRANSPORTATION SYSTEM IN UDA
- P7 NEED TO COORDINATE UTILITY NETWORKS WITHIN UDA
- P8 DISORGANIZED EXPANSION OF THE URBAN CENTERS OF UDA
- P9 THE DETROIT CENTRAL CITY SUFFERS AS THE CENTER OF A DISORGANIZED SYSTEM

SHELLS
- P10 POOR HOUSING CONDITIONS IN CENTRAL CITIES
- P11 NEED FOR COMMUNITY ORGANIZATION
- P12 INADEQUATE FUNCTIONING OF THE CBD'S OF CENTRAL CITIES
- P13 LACK OF SAFETY AND SECURITY IN THE CENTRAL AREAS
- P14 LOSS OF HUMAN SCALE

GENERAL — Institutional Structure
- G1 NEED FOR A GLM AGENCY
- G2 NEED FOR A UDA AGENCY
- G3 NEED FOR AN OVERALL DEVELOPMENT PLAN AND PROGRAM FOR UDA
- G4 NEED FOR SUBREGIONAL PLANS AND PROGRAMS
- G5 NEED FOR LOCAL PLANS AND PROGRAMS FOR DEVELOPING AREAS

NUMBER OF PROBLEMS ENCOUNTERED AT EACH SCALE: 3 · 10 · 10 · 11 · 14 · 23 · 31 · 30 · 32 · 12 · 5 | 15 · 29 · 35 · 5

NOTE: Generally the problems listed above are related to the physical elements of the settlements. Thus, under Society, only those socio-economic problems related to physical structure are included.

- ● Units Where Problem Exists
- ○ Units Where Problem Is Generated
- ◎ Units Where Action Should Be Taken

CATEGORIES OF ACTION
- A Immediate Impact
- B Change And Therapy
- C Growth And Change
- D General

Fig. 7: Categories of action under each program.

From the present to the future – A continuing process

Through a long process, the UDA study proceeded from problems to Concept-Plans to programs of action which aim at modifying gradually the directions now followed by the urban system. The life of a city, like the life of a biological system, is continuous; and action related to its development should be conceived as a continuous process. Therefore, the Concept-Plan and detailed plans and the general and detailed programs have to take this continuance into consideration in order to build toward a more meaningful, economic and justifiable process.

It is important to relate this continuing process to the four futures discussed in the Introduction of this volume. The effect of past and present forces acting on the city of the future is schematically presented in figure 8. The people living today exert an influence which will be felt for the next two or three generations. Many of today's buildings will last even longer than two or three generations and many facilities longer yet, especially through the commitments created by their networks. Indeed, present rights-of-way create still more enduring commitments for the future due to the conditions of land ownership and the road improvements and extensions which their very existence foretells. These commitments only gradually decrease after many generations. That force of the present most capable of influencing the future is man's conception of human settlements. Continuation of the past will largely determine what happens to cities tomorrow and in the near future. The more distant future, however, will depend much more on man's conception of future action and his ability to implement it.

One can also forecast the effects which past forces will have on the basis of existing trends and envisage the city of the past continuing into the future for the next two generations, much as it does today, before its influence begins to decline. Then comes the future which has been committed by the past through influences which will only be felt two to four generations from now. Finally, there is the "free action" created future, completely unhindered by the past, which increases the farther it moves from the present (fig. 9).

It is important to understand how these forces are related to what is considered desirable and undesirable. Much that is undesirable in the present city may be due to wrong actions taken in the past (fig. 10). Moreover, within the future committed by the past, more of the city may become undesirable because of ongoing trends. Such negative effects must be reduced. Finally, there is the created future where new concepts and patterns of growth can intervene and create increasingly large dimensions of desirable development. Eventually, by the gradual reduction of the undesirable forces of the past and by the steady expansion of the desirable influence of the created future, it will be possible to have a city substantially desirable in all aspects.

In conclusion, it is the understanding of the balance between these four futures and not the predominance of any one which can provide a wise solution of the problems and the successful implementation of the Concept-Plan. This is why the programs which aim to resolve these problems cannot really be independent from each other and are conceived as components of an overall and continuous effort.

Agents of implementation

General

A very important aspect related to the realization of the Concept-Plan and the implementation of the proposed 40 programs is the mobilization of the agents responsible for the necessary action.
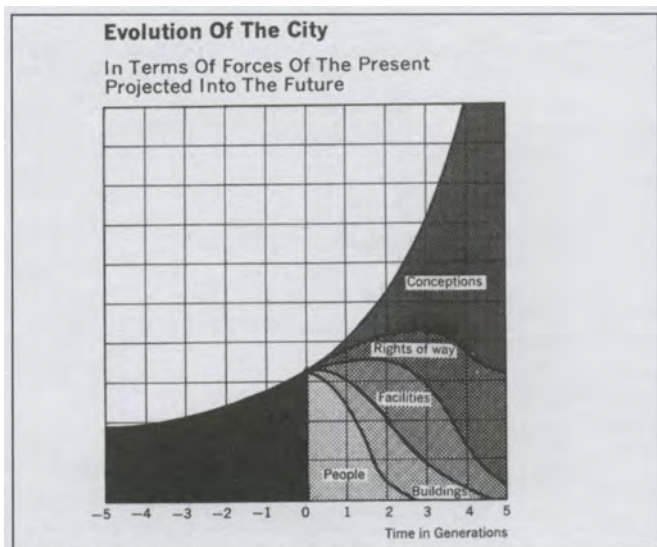
In terms of forces of the present projected into the future.
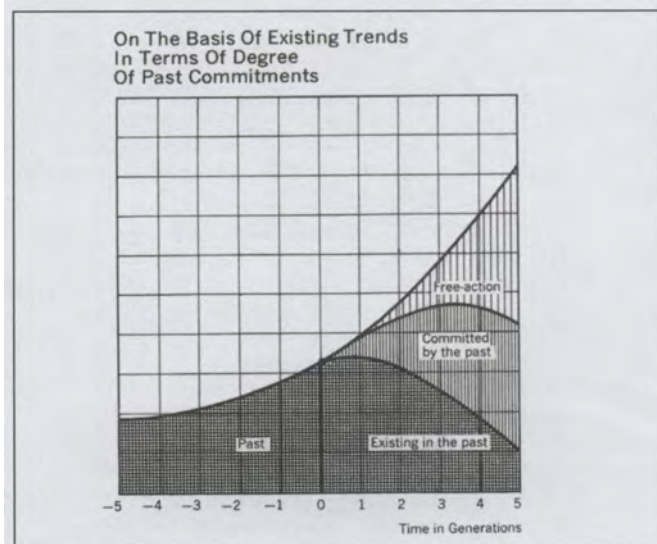
On the basis of existing trends in terms of degree of past commitments.
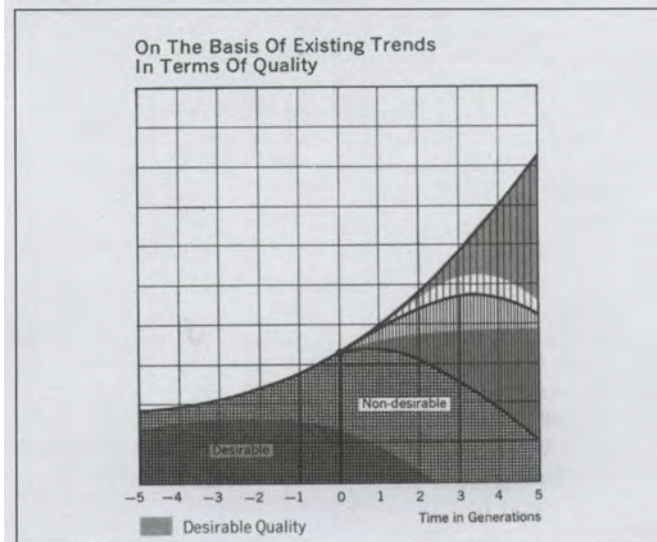
On the basis of existing trends in terms of quality.

Figs. 8, 9 and 10: Evolution of the city.

As explained in the previous chapter, every program refers to different activities at various levels where a problem exists. The task, therefore, is to define the levels of action and identify the agents of implementation at each level, a major undertaking considering the complexity of the problems involved and the multitude of those concerned with various aspects of implementation, from individuals to private and public organizations.

This chapter presents such a classification in a simplified way. It does not by any means attempt to exhaust the subject; extensive elaboration is required. Specific organizations at various levels of action are identified for the purpose of illustrating the type of organization which could be involved, but this does not mean they are the only agents responsible for implementation. Responsibility for action rests with all people belonging to all groups at all levels.

The responsibility for implementation

Having categorized the various types of action under the 40 programs, the question arises as to who will undertake the responsibility for implementation.

An overall effort such as this can provide a systematic approach to the definition of responsibilities for every specific program. To this end, responsibilities can first be distributed among three groups: individuals, private organizations and public organizations – from federal to local. There are over one thousand public organizations in UDA alone, thousands of private organizations and millions of individuals. The task of assigning responsibilities to these groups is extremely complex.

The coordination of all these agencies and individuals is also very complex. No single administrative authority is available to undertake the supervision and coordination necessary for the implementation of the program over all of UDA. The physical area spans a large number of political and administrative boundaries, from the international level down to that of the smallest unincorporated village. The individual programs recommended are those that must be executed by a variety of organizations in both the public and private sectors, from departments of federal governments to local municipalities, from large world-wide industrial corporations to small private housing developers, from semi-public international commissions to volunteer organizations of community and neighborhood residents.

Due to the governmental fragmentation which exists in UDA, coordinated action for the implementation of the Concept-Plan will require thousands of decisions by many agencies and considerable institutional interaction among public organizations. This interaction would be greatly facilitated through the existence of a single agency encompassing the entire area with clearly defined powers of coordination. Such an agency, however, cannot accomplish all facets of implementation since action would be needed on many levels. These levels are classified in the following pages.

Levels of action

The classification of problems in levels corresponding to ekistic units of different sizes provides the framework for the formulation of programs needed to face the corresponding problems. This classification also leads to the definition of the levels of action and to a first identification of the agents of implementation.

Some of the most important decisions relating to the implementation of the Concept-Plan will have to be taken at the national level. Without decisions at that level no reasonable hope can exist for the realization of the appropriate major land connections of UDA, especially since some of these

connections involve Canada. It would also be unrealistic to believe that matters of major importance for UDA – a new international airport, a new major educational and research center, for example – can be dealt with except at the national level.

The next level of action is defined by the special position of UDA within the Great Lakes area and the emerging Great Lakes megalopolis. The realization of the Concept-Plan would not only organize the internal general structure of UDA but would also provide for physical connections with the wider region, thereby enabling UDA to take advantage of its privileged position within the Great Lakes area and to facilitate its functional participation within the megalopolitan organism. A successful initiation of the overall program requires, therefore, the mobilization of all the important institutions interested in the Great Lakes area. To this end, it is very fortunate that the first step has already been taken with the creation of The Developing Great Lakes Megalopolis Research Project, which can provide the basis for such mobilization. All interested institutions may eventually decide to coordinate their efforts for future development through a single coordinating agency for the entire Great Lakes megalopolis area.

The next level of action is that of the UDA. At this level the most important single authority which best represents the area is the State of Michigan, within which is the largest and most important part of UDA. If coordination is to be achieved with the State of Ohio and the Province of Ontario on matters relating to the future of the area as a whole, the State of Michigan, with the prestige and powers that it possesses, could best take the initiative.

At the next level the most important section within UDA is its Central Region, i.e., metropolitan Detroit. Many essential aspects of the phase of implementation depend on the decisions and the support of a number of agencies which have far-reaching influence over this or wider areas. Organizations such as the Southeast Michigan Council of Governments (SEMCOG) are the natural agencies to initiate action on this level and to achieve the proper coordination.

On the same level, effort should also be directed to the area where the new twin urban center is proposed. Many essential aspects of implementation depend on the decisions and support of local authorities in St. Clair and Macomb counties. Action would also be needed in all the subregions responsible for coordinating action in their areas. Thus organizations such as the Tri-County Regional Planning Commission in the Lansing Area and the Toledo Area Metropolitan Council of Governments (TAMCOG) have an important role in the process of implementation.

The next level of action corresponds to the central parts of the metropolitan areas of UDA, the most important of which is the City of Detroit. The importance of this area to UDA and the significance of its present decline in the overall development have been demonstrated in this study. The most important single group of representatives in the area are the city authorities. Developing programs would have to be carried out with the cooperation of both state and city governments.

The next level corresponds to the central business districts. It is believed that for the initial steps of the implementation process, efforts should be focused on the most important CBD, that of Detroit, as well as those of Lansing, Flint, Toledo, etc. Many important decisions can be made for this area at the level of the city to which the central business district belongs, in cooperation with the state and federal governments. Additional efforts have to be undertaken by groups representing the private agencies and organizations which have establishments and interests in the CBD. Among them, the business and private organizations which control large re-

al estate properties in the CBD should be mobilized so that a consensus can be reached on the principles underlying the action to be taken. On this basis, the formulation of a revitalization program carried out and financed mainly by these organizations could be guaranteed. Action at this level would also refer to residential communities. As a first step, action by the city in cooperation with local groups can be initiated in the 28 communities on which the proposals for the reorganization of Detroit Central City have been based.

Agents of action

These considerations could lead to a general classification of the agents of implementation by the levels of action involved (fig. 11). This classification indicates the group which is primarily responsible for the implementation of programs for each of the 40 main problems at each level of action. In most cases more than one group on the same level of action is responsible for implementation of a program. Thus action at the larger scales of a problem would require the mobilization of both private and public organizations. At lower levels, neighborhood and below, the responsibility for action is mainly shared between individuals and public organizations.

As may be seen, individuals, alone or with other agents, generally have a primary role in the implementation of programs related to 8 of the 40 main problems, mainly referring to the physical structure in terms of private buildings as well as to the natural environment. Private organizations are involved in the implementation of programs pertaining to 33 of the 40 main problems, mainly related to socio-economic aspects, as well as to the physical structure. Public agencies are involved in the necessary action on all 40 programs.

It is clear from the above that public and private organizations would have to share the major part of the responsibility for implementation, and close collaboration would be required by all groups. Experience has shown that government agencies very often have to be inspired, mobilized, sometimes even guided at the beginning by the action of individuals and private organizations. Though legal responsibility may well lie with public organizations, full moral responsibility rests with all three groups. It might be said that since public organizations are staffed by individuals, the responsibility lies first with individuals, then with all types of private and public organizations.

Elaboration could lead to different conclusions. Private and public organizations could assign responsibility to one another, and some groups at every level of action could easily avoid their responsibilities by assigning responsibility to other levels. It must, therefore, be stressed again that while such a classification helps to define groups mainly responsible at various levels of action, it does not in any way imply that responsibility does not rest with all people belonging to all groups at all levels.

The phasing of implementation

General

The successful implementation of the proposed 40 programs will depend on the careful phasing of the process at all levels of action. The determination of the interrelation and interdependence of various programs is of great importance in order that the whole effort can be coordinated at all levels of implementation. This is a major task which should receive close scrutiny in the detailed elaboration of these programs. At this stage, where only the basic dimensions and targets of the programs are outlined, one can only stress the importance and need for such an endeavor. This chapter explains the reasons for immediately implementing all programs and out-

lines the basic steps through which the process of implementation should proceed.

When action should be taken

Having defined the agents of implementation, it is necessary to determine the phasing of action needed under the 40 programs.

As already mentioned, the 40 programs should get under way immediately. Immediacy is related to the pressing needs which most programs must meet, and to the speed at which results can and must be expected. In fact, immediate action under certain programs is needed to relieve human suffering. For some programs immediate action is needed due to their big importance to the whole system and the intensive effort required at the initial stages to lay the foundations of the new development proposed in the Concept-Plan before unfavorable commitments are made. In some cases preparation for dealing with problems may already exist. Thus intensive action would be needed under some programs so that they can be utilized and brought within the framework of the proposed future development.

A classification according to the above categories of needs reveals that intensive immediate action is required for 34 of the 40 programs (fig. 12). Thus 85 percent of the total effort has to start immediately due to pressing needs. Although the other 6 programs may not face pressing needs they should also start immediately in order to assure a balanced overall development. Any important delay in the implementation of these programs could jeopardize the success of the other 34.

Since all 40 programs form part of an interrelated system (fig. 13), they cannot solve any of the problems effectively unless all are undertaken simultaneously. For example, even the greatest effort to improve poor housing conditions in central cities by action at several levels may not succeed if safety and security are not guaranteed, if air pollution is not controlled and if the central cities continue to decline. The same can be said of improvements in education without amelioration of the whole system causing the decline of the central city. Unless the central city is revitalized in all respects, residents will ultimately abandon it, even if they get higher education and higher income, because the central city will not be a desirable place to live.

It is, therefore, of the greatest importance that the process of implementing all 40 main programs should start immediately in a coordinated way. Phasing cannot be a matter of selecting some programs for action in an initial period and others for later periods. However, various actions under a certain program can have a tremendous bearing on actions of other programs if initiated in the proper sequence according to their inter-dependency. Coordinated phasing of activities under all 40 main programs is, therefore, a major element for successful implementation and should be studied in the detailed elaboration of these programs.

How action should proceed

It may be generally stated that the process of implementation for each of the 40 programs will have to proceed through the following steps:

Step One: Detailed study, where needed, and testing of the basic concepts and assumptions which underlie the proposals of the Concept-Plan in each sector of development. This includes modifications, where appropriate, and provision of the necessary material for general acceptance of the basic proposals.

Step Two: Presentation, discussion and acceptance of the

Agents Of Action

EKISTIC UNITS		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	PROBLEMS ENCOUNTERED BY VARIOUS GROUPS OF AGENTS		
DESIGNATION OF UNITS AND CORRESPONDING STUDY AREAS		MAN	ROOM	DWELLING	DWELLING GROUP	SMALL NEIGHBORHOOD	NEIGHBORHOOD	SMALL TOWN	TOWN (CBD's)	LARGE CITY (CITIES)	METROPOLIS (SUB-REGIONS)	CONURBATION (UDA)	MEGALOPOLIS (GLM)	URBAN REGION (USA AND CANADA)	URBANIZED CONTINENT	ECUMENOPOLIS			
COMMUNITY CLASS	MAIN PROBLEMS & NEEDS				I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			

			Main Problems & Needs	
NATURE	Natural Environment	N1	UNFAVORABLE CLIMATE IN GLM	
		N2	DESPOLIATION OF LAND RESOURCES AT ALL SCALES	
		N3	LACK OF RECREATIONAL AREAS AT ALL SCALES	
		N4	POLLUTION OF WATER AT ALL SCALES	
		N5	POLLUTION OF AIR AT ALL SCALES	
MAN	Demography	M1	GROWTH RATES IN GLM AND UDA FALLING BELOW NATIONAL AVERAGE	
		M2	DECLINING GROWTH RATE IN CENTRAL REGION	
		M3	DECLINING POPULATION IN CENTRAL AREAS	
SOCIETY	Socio-Economic Structure	S1	HIGH RELIANCE OF UDA ECONOMY ON A SINGLE SECTOR	
		S2	UNDERDEVELOPED SERVICES SECTOR IN UDA	
		S3	LOW PERCENTAGE OF WHITE COLLAR WORKERS IN UDA	
		S4	LOW EDUCATIONAL ATTAINMENT IN CENTRAL REGION	
		S5	DECLINE OF INCOME IN CENTRAL AREAS	
		S6	DECLINE OF RETAIL SALES IN CENTRAL AREAS	
		S7	DECLINE OF OTHER ECONOMIC ACTIVITIES IN CENTRAL AREAS	
		S8	DECLINE OF TAX BASE IN CENTRAL AREAS	
		S9	ECONOMIC SEGREGATION	
		S10	RACIAL SEGREGATION	
		S11	INCREASING GAP OF CHOICES BETWEEN GROUPS OF PEOPLE	
		S12	SEGREGATION OF AGE GROUPS IN CFA	
		S13	OTHER PROBLEMS OF SOCIAL IMPORTANCE	
NETWORKS	Physical Structure	P1	NEED TO COORDINATE UDA'S LAND CONNECTIONS WITH ITS WIDER REGION	
		P2	NEED TO COORDINATE UDA'S UTILITY NETWORKS WITH THOSE OF THE WIDER REGION	
		P3	NEED FOR BETTER CONNECTION OF WESTERN MICHIGAN AND THE UPPER PENINSULA WITH UDA	
		P4	LIMITED DEVELOPMENT OF WATER TRANSPORTATION	
		P5	INADEQUATE FACILITIES TO MEET NEW DEMANDS OF AIR TRANSPORTATION	
		P6	NEED FOR NEW ORGANIZATION FOR THE LAND TRANSPORTATION SYSTEM IN UDA	
		P7	NEED TO COORDINATE UTILITY NETWORKS WITHIN UDA	
		P8	DISORGANIZED EXPANSION OF THE URBAN CENTERS OF UDA	
		P9	THE DETROIT CENTRAL CITY SUFFERS AS THE CENTER OF A DISORGANIZED SYSTEM	
SHELLS		P10	POOR HOUSING CONDITIONS IN CENTRAL CITIES	
		P11	NEED FOR COMMUNITY ORGANIZATION	
		P12	INADEQUATE FUNCTIONING OF THE CBD'S OF CENTRAL CITIES	
		P13	LACK OF SAFETY AND SECURITY IN THE CENTRAL AREAS	
		P14	LOSS OF HUMAN SCALE	
GENERAL	Institutional Structure	G1	NEED FOR A GLM AGENCY	
		G2	NEED FOR A UDA AGENCY	
		G3	NEED FOR AN OVERALL DEVELOPMENT PLAN AND PROGRAM FOR UDA	
		G4	NEED FOR SUBREGIONAL PLANS AND PROGRAMS	
		G5	NEED FOR LOCAL PLANS AND PROGRAMS FOR DEVELOPING AREAS	

| NUMBER OF PROBLEMS ENCOUNTERED AT EACH SCALE | | | 3 | 10 | 10 | 11 | 14 | 23 | 31 | 30 | 32 | 12 | 5 | | | 8 | 33 | 40 |

NOTE: Generally the problems listed above are related to the physical elements of the settlements. Thus, under Society, only those socio-economic problems related to physical structure are included.

- ● Units Where Problem Exists
- ○ Units Where Problem Is Generated
- ◯ Units Where Action Should Be Taken

- A — Individuals
- B — Private Organizations
- C — Public Organizations

Fig. 11: Agents of action.

Main Reasons For Immediate Action Under Each Program

EKISTIC UNITS		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	PROBLEMS REQUIRING IMMEDIATE ACTION FOR VARIOUS REASONS			
DESIGNATION OF UNITS AND CORRESPONDING STUDY AREAS		MAN	ROOM	DWELLING	DWELLING GROUP	SMALL NEIGHBORHOOD	NEIGHBORHOOD	SMALL TOWN	TOWN (CBD's)	LARGE CITY (CITIES)	METROPOLIS (SUB-REGIONS)	CONURBATION (UDA)	MEGALOPOLIS (GLM)	URBAN REGION (USA AND CANADA)	URBANIZED CONTINENT	ECUMENOPOLIS				
MAIN PROBLEMS & NEEDS / COMMUNITY CLASS					I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII				
NATURE (Natural Environment)	N1	UNFAVORABLE CLIMATE IN GLM				◉	◉	◉	◉	◉	◉	◉	◉	◉					●	
	N2	DESPOLIATION OF LAND RESOURCES AT ALL SCALES				◉	◉	◉	◉	◉	◉	◉	◉	○						
	N3	LACK OF RECREATIONAL AREAS AT ALL SCALES				◉	◉	◉	◉	◉	◉	◉	◉			●	●			
	N4	POLLUTION OF WATER AT ALL SCALES				◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	●	●			
	N5	POLLUTION OF AIR AT ALL SCALES			◉	◉	◉	◉	◉	◉	◉	◉				●		●		
MAN (Demography)	M1	GROWTH RATES IN GLM AND UDA FALLING BELOW NATIONAL AVERAGE									○	◉	◉	◉						
	M2	DECLINING GROWTH RATE IN CENTRAL REGION								○	◉	◉	○	○						
	M3	DECLINING POPULATION IN CENTRAL AREAS							◉	◉	○	○								
SOCIETY (Socio-Economic Structure)	S1	HIGH RELIANCE OF UDA ECONOMY ON A SINGLE SECTOR								○	◉	◉	◉						●	
	S2	UNDERDEVELOPED SERVICES SECTOR IN UDA								○	◉	◉	◉						●	
	S3	LOW PERCENTAGE OF WHITE COLLAR WORKERS IN UDA									◉	◉	◉			●			●	
	S4	LOW EDUCATIONAL ATTAINMENT IN CENTRAL REGION									◉	◉	◉			●			●	
	S5	DECLINE OF INCOME IN CENTRAL AREAS								◉	◉	○	○			●			●	
	S6	DECLINE OF RETAIL SALES IN CENTRAL AREAS								◉	◉	◉	○				●			
	S7	DECLINE OF OTHER ECONOMIC ACTIVITIES IN CENTRAL AREAS								◉	◉	◉	○				●			
	S8	DECLINE OF TAX BASE IN CENTRAL AREAS								◉	◉	◉	○				●			
	S9	ECONOMIC SEGREGATION						◉	◉	◉	◉	◉	○			●			●	
	S10	RACIAL SEGREGATION						◉	◉	◉	◉	◉	○			●			●	
	S11	INCREASING GAP OF CHOICES BETWEEN GROUPS OF PEOPLE									◉	◉	◉			●				
	S12	SEGREGATION OF AGE GROUPS IN CFA									◉	◉	○						●	
	S13	OTHER PROBLEMS OF SOCIAL IMPORTANCE				◉	◉	◉	◉	◉	◉	◉	◉			●			●	
NETWORKS (Physical Structure)	P1	NEED TO COORDINATE UDA'S LAND CONNECTIONS WITH ITS WIDER REGION										◉	◉	◉			●			
	P2	NEED TO COORDINATE UDA'S UTILITY NETWORKS WITH THOSE OF THE WIDER REGION										◉	◉	◉			●			
	P3	NEED FOR BETTER CONNECTION OF WESTERN MICHIGAN AND THE UPPER PENINSULA WITH UDA										◉	◉				●			
	P4	LIMITED DEVELOPMENT OF WATER TRANSPORTATION								○	◉	◉	◉	○						
	P5	INADEQUATE FACILITIES TO MEET NEW DEMANDS OF AIR TRANSPORTATION								○	◉	◉	◉	○						
	P6	NEED FOR NEW ORGANIZATION FOR THE LAND TRANSPORTATION SYSTEM IN UDA								○	◉	◉	○			●				
	P7	NEED TO COORDINATE UTILITY NETWORKS WITHIN UDA								○	◉	◉	○			●				
	P8	DISORGANIZED EXPANSION OF THE URBAN CENTERS OF UDA								○	◉	○				●				
	P9	THE DETROIT CENTRAL CITY SUFFERS AS THE CENTER OF A DISORGANIZED SYSTEM							◉	◉	◉					●				
SHELLS (Physical Structure)	P10	POOR HOUSING CONDITIONS IN CENTRAL CITIES			●	●	◉	◉	◉	◉	◉	○	○			●			●	
	P11	NEED FOR COMMUNITY ORGANIZATION				◉	◉	◉	◉	◉	◉	○				●			●	
	P12	INADEQUATE FUNCTIONING OF THE CBD'S OF CENTRAL CITIES					◉	◉	◉	◉	○	○				●			●	
	P13	LACK OF SAFETY AND SECURITY IN THE CENTRAL AREAS				◉	◉	◉	◉	◉	○					●			●	
	P14	LOSS OF HUMAN SCALE			◉	◉	◉	◉	◉	◉	○					●			●	
GENERAL (Institutional Structure)	G1	NEED FOR A GLM AGENCY												◉						●	
	G2	NEED FOR A UDA AGENCY											◉				●				
	G3	NEED FOR AN OVERALL DEVELOPMENT PLAN AND PROGRAM FOR UDA											◉				●				
	G4	NEED FOR SUBREGIONAL PLANS AND PROGRAMS										◉							●		
	G5	NEED FOR LOCAL PLANS AND PROGRAMS FOR DEVELOPING AREAS					◉	◉	◉	◉	◉								●		
NUMBER OF PROBLEMS ENCOUNTERED AT EACH SCALE				3	10	10	11	14	23	31	30	32	12	5		15	12	21	9	

NOTE: Generally the problems listed above are related to the physical elements of the settlements. Thus, under Society, only those socio-economic problems related to physical structure are included.

● Units Where Problem Exists
○ Units Where Problem Is Generated
◉ Units Where Action Should Be Taken

A To Relieve Human Distress
B To Create New System Of Future Development According To Concept-Plan
C To Utilize On Going Efforts Within New Development Frame Of Concept-Plan
D To Secure Balanced Overall Development

Fig. 12: Main reasons for immediate action under each program.

Interrelation Of Problems And Programs

PROBLEMS AND NEEDS | **PROGRAMS**

NATURE	Natural Environment	N1	UNFAVORABLE CLIMATE IN GLM
		N2	DESPOLIATION OF LAND RESOURCES AT ALL SCALES
		N3	LACK OF RECREATIONAL AREAS AT ALL SCALES
		N4	POLLUTION OF WATER AT ALL SCALES
		N5	POLLUTION OF AIR AT ALL SCALES
MAN	Demography	M1	GROWTH RATES IN GLM AND UDA FALLING BELOW NATIONAL AVERAGE
		M2	DECLINING GROWTH RATE IN CENTRAL REGION
		M3	DECLINING POPULATION IN CENTRAL AREAS
SOCIETY	Socio-Economic Structure	S1	HIGH RELIANCE OF UDA ECONOMY ON A SINGLE SECTOR
		S2	UNDERDEVELOPED SERVICES SECTOR IN UDA
		S3	LOW PERCENTAGE OF WHITE COLLAR WORKERS IN UDA
		S4	LOW EDUCATIONAL ATTAINMENT IN CENTRAL REGION
		S5	DECLINE OF INCOME IN CENTRAL AREAS
		S6	DECLINE OF RETAIL SALES IN CENTRAL AREAS
		S7	DECLINE OF OTHER ECONOMIC ACTIVITIES IN CENTRAL AREAS
		S8	DECLINE OF TAX BASE IN CENTRAL AREAS
		S9	ECONOMIC SEGREGATION
		S10	RACIAL SEGREGATION
		S11	INCREASING GAP OF CHOICES BETWEEN GROUPS OF PEOPLE
		S12	SEGREGATION OF AGE GROUPS IN CFA
		S13	OTHER PROBLEMS OF SOCIAL IMPORTANCE
NETWORKS	Physical Structure	P1	NEED TO COORDINATE UDA'S LAND CONNECTIONS WITH ITS WIDER REGION
		P2	NEED TO COORDINATE UDA'S UTILITY NETWORKS WITH THOSE OF THE WIDER REGION
		P3	NEED FOR BETTER CONNECTION OF WESTERN MICHIGAN AND THE UPPER PENINSULA WITH UDA
		P4	LIMITED DEVELOPMENT OF WATER TRANSPORTATION
		P5	INADEQUATE FACILITIES TO MEET NEW DEMANDS OF AIR TRANSPORTATION
		P6	NEED FOR NEW ORGANIZATION FOR THE LAND TRANSPORTATION SYSTEM IN UDA
		P7	NEED TO COORDINATE UTILITY NETWORKS WITHIN UDA
		P8	DISORGANIZED EXPANSION OF THE URBAN CENTERS OF UDA
		P9	THE DETROIT CENTRAL CITY SUFFERS AS THE CENTER OF A DISORGANIZED SYSTEM
SHELLS		P10	POOR HOUSING CONDITIONS IN CENTRAL CITIES
		P11	NEED FOR COMMUNITY ORGANIZATION
		P12	INADEQUATE FUNCTIONING OF THE CBD'S OF CENTRAL CITIES
		P13	LACK OF SAFETY AND SECURITY IN THE CENTRAL AREAS
		P14	LOSS OF HUMAN SCALE
GENERAL	Institutional Structure	G1	NEED FOR A GLM AGENCY
		G2	NEED FOR A UDA AGENCY
		G3	NEED FOR AN OVERALL DEVELOPMENT PLAN AND PROGRAM FOR UDA
		G4	NEED FOR SUBREGIONAL PLANS AND PROGRAMS
		G5	NEED FOR LOCAL PLANS AND PROGRAMS FOR DEVELOPING AREAS

VERTICALLY

■ Main Problem Or Need Related To Corresponding Program

● Other Problem Or Need Affected By Action Of The Program

○ Other Problem Or Need Affecting The Program

◐ Other Problem Or Need Affecting And Affected By Action Of The Program

HORIZONTALLY

Main Program Related To Corresponding Problem Or Need

Other Program Affecting Solution Of The Problem Or Need

Other Program Affected By Solution Of The Problem Or Need

Other Program Affecting And Affected By Solution Of The Problem Or Need

Fig. 13: Interrelation of problems and programs.

concepts developed in Step One by the appropriate private groups, the sponsors of programs and the responsible agencies.

Step Three: Further development of the conception and preparation of specific plans with the publication of related reports for the general public.

Step Four: Approval of the final plans by appropriate authorities.

Step Five: Financing and execution.

Although the above steps are considered a necessary part of implementing each program, not all five steps need apply to each individual action at various scales. In fact, action under programs referring to the large scales, the United States and Great Lakes megalopolis as well as UDA and possibly the subregions, will deal with basic concepts and overall considerations and therefore cover only the first three steps. Action at lower scales will have to deal with actual design and implementation and will cover only steps Three to Five.

The forty programs

The preceding discussion on the various questions related to implementation provides broad directives for a first examination of the basic dimensions of each of the 40 programs proposed. These refer to the levels at which action should be taken, the kind of action required, the agents to undertake it and the phasing of the actions related to each program.

Specific proposals on each of the above aspects can be formulated only after extensive elaboration of each program and careful consideration of the interrelation of each program with all the others. The objective here is to present a first outline for each program in order to provide a starting point for the complex process of implementation.

Program N1

Problem: Unfavorable aspects of winter climate in the Great Lakes megalopolis in relation to other areas.

Target: To reduce unfavorable climatic effects whenever possible.

Levels of action: Although climate influences all units at all levels, it cannot be faced realistically in the larger scales, at least in the foreseeable future. Some measures can only be taken at lower levels such as buildings, dwelling groups, neighborhoods and corresponding institutional building groups, such as educational campuses, commercial centers, etc.

Action needed: Action in this program should be directed at both existing and new large building complexes. Solutions can be found in enclosed walkways, squares and streets, as well as in open sidewalks heated to prevent the accumulation of snow and ice. At the scale of the Central Functions Area, the proposals of the Concept-Plan to create superblocks and different levels for pedestrian and vehicular movements in these central areas will greatly facilitate such solutions.

Agents of action: Public agencies would have to provide the necessary legislative framework as well as a demonstration of the basic principles involved in public building complexes, heated or enclosed sidewalks, squares and streets. However, the major role in the process of implementation will fall to private individuals or organizations, as these are the owners of most of the land in cities.

Phasing of action: The implementation of such programs should and could start immediately in existing important building complexes, especially within the central functions areas of existing cities or new building complexes in the outskirts. It should also affect all new construction, especially in the centers of new cities.

Program N2

Problem: Despoliation of land resources at all scales.

Target: To reserve land for the future development of all urban uses and functions, ensuring at the same time the preservation of land resources with natural beauty.

Levels of action: Creation of land banks to secure the land to be required for future development. Such action would be based on the proposals of elaborated land use plans for UDA and its subregions. At lower scales action should be directed toward enforcing the necessary codes and regulations to ensure that in each local plan adequate provision will be made for optimum use of land resources in order to create a balanced environment. The most important action, however, is to prepare local plans in advance of urban development, before undesirable commitments are created.

Agents of action: The responsibility for the implementation of these programs would lie primarily with the public agencies, particularly at the larger scales. Although the major effort has to be carried out at the UDA level, considerable support may be obtained from federal authorities such as the U.S. departments of the Interior, Agriculture, and Housing and Urban Development, as well as their Canadian counterparts. At the state level, the appropriate agencies would be the departments of Natural Resources and State Planning. At lower levels, regional authorities and local governing bodies would have to play an active role. A major private non-profit sector that would also have an interest in these programs are conservation and environmental control organizations.

Phasing of action: Results can be expected in large scale units after the needs have been specified and legislative and financial procedures have been made. Action in this direction must be initiated at the first stages of development before further disorganized commitments are made and more land is spoiled. At the small scale, however, local action by public and private bodies can be immediately undertaken in order to save pieces of land now in the process of being spoiled.

Program N3

Problem: Lack of recreational areas.

Target: To reserve land for recreational uses in order to satisfy present needs in the most urbanized sections of UDA as well as future needs at all scales of study.

Levels of action: Action should continue at all levels in order to reserve land for future needs and at specific levels in order to complete the acquisition of land needed for the existing population.

Action needed: Action for this program should be coordinated with the overall program for reservation of land for all uses. It is particularly important, however, to proceed immediately with the necessary surveys which will define the extent, type and quality of the various areas presenting potential for the development of such uses. Reservation of such areas can follow on the basis of the general guidelines of the Concept-Plan and the more specific design suggestions included in it for the lower scales.

Agents of action: The departments of Natural Resources should be responsible at the state level with the assistance of the Department of Housing and Urban Development, the Department of Agriculture and the Department of Interior at the federal level. The Huron-Clinton Metropolitan Park Authority is an example of agencies to be mobilized at the level of subregions. Local governing bodies should undertake implementation at lower levels. In the City of Detroit the effort to improve existing conditions could be undertaken by the Department of Parks and Recreation, the Mayor's Committee for Community Renewal and the City of Detroit Housing Commission.

Phasing of action: Action at higher levels for the reservation of an adequate future recreational system connected and directed by the expected growth of population should be initiated immediately. Reservation of land is generally considered of first priority while development of facilities within the areas acquired could be evenly spread throughout the development period. More intensive effort at the initial stages should be made in order to improve existing conditions of imbalance between people and land resources where necessary.

Program N4

Problem: Lack of proper quality of water at all scales.

Target: To establish effective water quality control.

Levels of Action: Action is necessary at all scales where the problem exists, from dwelling groups up to the Great Lakes megalopolis as a whole.

Action needed: Specific measures to be applied will be determined by the relevant research now under way nationally. Such measures would have to be implemented locally but should be conceived within a regional framework at the Great Lakes megalopolis scale because of the major bodies of water that form an interconnected system.

Agents of action: International, federal, state and interstate authorities such as the International Joint Commission (United States and Canada), Water Resources Council, Department of Housing and Urban Development, Department of the Interior, the U.S. Army Corps of Engineers, the State Water Resources Commission and the Great Lakes Basin Commission are already involved. The Southeast Michigan Council of Governments, the City of Detroit Water Board and the Huron Watershed Council would be associated with action at the subregional scale while local governing bodies, sanitation departments, private organizations and individuals could contribute to implementation at lower levels.

Phasing of action: Action at all levels should be taken immediately due to the dimensions of the problem and its possible effects on future development. Priority should be given to action at the higher levels which will create the basis for the solution of the problem.

Program N5

Problem: Lack of proper quality of air at all scales.

Target: To establish effective air quality control.

Levels of Action: The problem covers all scales from subregions down to the dwelling group. Measures should be taken in all units affected on the basis of standards to be defined within the framework of a wider effort at the larger scales of UDA, the Great Lakes megalopolis or even the United States.

Action needed: Specific measures to be applied will be determined by the special studies under way at various levels.

Agents of action: The Department of Health, Education and Welfare, as well as the National Center for Air Pollution Control, is already involved at the federal level. At the state level there is the Air Pollution Control Commission. At the subregional level, regional commissions to be created under the U.S. Air Quality Act of 1967 would be associated with this program. Local governing bodies should also participate in the effort by adopting and enforcing air quality standards. The contribution of private institutions could be channeled to research efforts at the higher levels as well as to the implementation at lower levels, in which the participation of private citizens would also be important.

Phasing of action: Immediate action is needed to relieve human suffering at lower levels where the problem is more acute. Immediate action at higher levels should be directed toward creating a framework for action at all scales throughout the development period.

Program M1

Problem: Population growth rates in UDA and the Great Lakes megalopolis falling below national average after 1960.

Target: To reverse the recent trends of out-migration.

Levels of action: Action should be taken mainly at the larger scales of the Great Lakes megalopolis and UDA.

Action needed: Action should primarily be directed toward the creation of the preconditions for the attraction of new economic forces in the respective areas. In general, this is one of the major objectives of the recommendations made by the UDA study. Without an overall improvement of the situation it will be very difficult to keep forces from moving out. However, this particular program should also depend on special economic studies. Specific measures to be taken should be derived from such studies and be implemented in coordination with the programs of an economic nature proposed by this study (S1-S3). It is also true that in recent years, and perhaps more so in the future, the attraction of people and economic forces to a given area has depended on the overall natural and physical environment in this area. It is, therefore, necessary for this program to be implemented in parallel and coordinated with other programs proposed by this study, particularly the programs of physical structure (P1-P4) and those of the natural environment (N1-N5).

Agents of action: This problem can only be faced by close cooperation between the private sector of industry and commerce and the public agencies acting mainly at the levels of the Great Lakes area and UDA. The federal governments of the United States and Canada could provide assistance in the implementation of certain relevant programs. However, special aid from a national government could only be expected in periods of acute crisis, which is not the case at present in UDA and the Great Lakes megalopolis.

Phasing of action: This is a long-term program which should start immediately. Since action does not aim to alleviate immediate human needs, it could be conceived and programmed as a continuous effort spread throughout the implementation period.

Program M2

Problem: Declining population growth rates in the Central Region.

Target: To reverse the recent trends and ensure continuous growth in this area.

Levels of action: Relevant action should be taken at the level of the Central Region as well as at the higher levels of UDA. Action is also related to the lower level because the present conditions in the Detroit Central City are definitely contributing to the creation of the problem.

Action needed: The effort should again be concentrated on the creation of the preconditions which would lead to both the physical and economic revitalization of the Central Region. At this scale the impact of the reorganization of the physical structure and of the improvement of the natural environment is expected to be greater than for the larger scale of UDA. Therefore, immediate action should refer to the initiation of the key programs suggested in this area on the basis of the Concept-Plan. Particular importance should be given to the programs of remodeling and revitalizing the Detroit Central City, which is the most critical part of the Central Region. Coordination of this program with those of a socio-economic nature should also be effected while special economic studies should be undertaken to define other specific economic measures for the solution of this problem.

Agents of action: Action should be taken by public agencies and particularly by the State of Michigan. Other organizations such as the Detroit Metropolitan Fund as well as pri-

vate industry should also undertake an active role.

Phasing of action: To achieve its target this program should be conceived as continuous and long term although particular emphasis should be given to the initial stages as mentioned above.

Program M3

Problem: Decline of population in central areas, particularly in the Detroit Central City.

Target: To reverse this trend of population decline.

Levels of action: This problem mainly exists at the levels of central functions areas and central cities. Relevant action should be taken at these levels as well as at those of subregions and UDA, the present conditions of which also contribute to the problem.

Action needed: At this level the measures related to the improvement of the urban and natural environments and to the reorganization of the functioning of the cities are of key importance for the solution of the problem.

In the Detroit Central City the creation of a better transportation system, its reorganization into self-contained communities, the remodeling of neighborhoods, the creation of better housing conditions and the improvements of its Central Functions Area, combined with action for the implementation of the key projects proposed for the Central Region and UDA, are expected to create the basis for the solution of this problem. This program for Detroit should be carried out in close coordination with the previous program for the Central Region, while similar coordination should be effected in the other areas where this problem exists. This program must also be coordinated with the other proposed programs of socioeconomic nature (S5-S13) and possibly include additional measures to be derived from special economic studies.

Agents of action: Action should be taken by public authorities, particularly the State of Michigan and the City of Detroit, in close cooperation with other organizations such as the Detroit Metropolitan Fund and private industry and business.

Phasing of action: This is also a long-term program which should start immediately. Continuous effort should be made throughout the implementation period.

Program S1

Problem: Heavy reliance of UDA's economy on a single industry.

Target: To create a more diversified economy in UDA.

Levels of action: The problem mainly exists at the levels of cities, subregions and UDA. Relevant action should be taken at those scales.

Action needed: Action under this program would aim at the development of the services sector as well as of both existing and new manufacturing activities associated with non-durable goods production. This is a tremendous task which will require detailed study on the most suitable types of such activities, as well as on the possible ways and means by which corresponding activities existing in the area could be developed and new ones attracted. The successful implementation of this program would also be greatly assisted by the physical revitalization of the Detroit Central City through other programs.

Agents of action: Action under this program would provide ideal opportunities for cooperation between the private and public sectors. Excellent opportunities rest with public corporations to provide the guidelines, promotion and facilities for restructuring UDA's economy.

Relevant action is already being taken by public agencies such as the Michigan Department of Commerce in providing the necessary guidelines and orientation. The process of im-

plementation will, of course, be greatly assisted by the support of the leadership of private corporations, which will also undertake the initiative in making the necessary investments.

Phasing of action: This is a long-term program which should start immediately with intensive action at the initial stages to utilize all ongoing efforts within the new development framework of the Concept-Plan.

Program S2

Problem: Underdeveloped services sector in UDA.

Target: To promote the development of high-order services in UDA.

Levels of action: Action here would have to be coordinated with Program S1 mainly at the levels of cities, subregions and UDA, where the problem exists.

Action needed: This program should stimulate the development of the services sector. It may be considered as a contribution toward the success of the previous program, i.e., the achievement of a broader economic structure in UDA. Essential measures for the success of this program are: the promotion of existing services and the attraction of new and particularly of high-order service activities, the strengthening of existing and the creation of new commercial and service centers provided in the Concept-Plan, the physical revitalization of central areas and especially of the CBDs and, above all, the creation of the new twin urban center. In addition, the objectives of this program should be pursued in connection with those of other programs such as S5, S6, S7, P12 and P13, given the close relationships among them.

Agents of action: Both public agencies and private corporations would be involved in the implementation of such a program. Public organizations would be concerned with the provision of the necessary guidelines, promotion and facilities at both the state and local levels. Such efforts are being made by public organizations and maximum coordination would have to be attained. On the other hand, the initiative and the actual investments required for such a program would, of course, be provided by private corporations.

Phasing of action: This is a long-term program which should start immediately, with intensive action at the initial stages in order to coordinate and utilize all ongoing effort within the framework of the new development concept.

Program S3

Problem: Low percentage of white collar workers in UDA.

Target: To increase the percentage of white collar workers.

Levels of action: The problem exists at the levels of cities, subregions and UDA. Relevant action should be taken at these scales.

Action needed: The problem mainly results from the manufacturing orientation of the area's economy, and action should be coordinated with other programs aiming at the promotion of the services sector, the diversification of the UDA economy, and the orientation toward higher educational requirements, all of which would provide a stimulus for the improvement of the occupational distribution of the labor force.

Agents of action: A variety of federal programs are currently being aimed at the development of manpower programs through local agencies such as the Southeast Michigan Council of Governments, which receives aid from the federal government to develop and coordinate such programs. Action would, therefore, have to be taken by public and private organizations to coordinate and utilize the effort of other relevant programs toward the solution of this problem.

Phasing of action: Long-term action should start immediately with intensive effort at the initial stages in order to improve the conditions where the problem is more acute, as

well as to coordinate and utilize ongoing and new efforts under this and other related programs.

Program S4

Problem: Educational attainment in the Central Region which is below average for urbanized areas of the United States.

Target: To increase the level of educational attainment in the Central Region.

Levels of action: This problem mainly exists in the Central Region and the Detroit Central City. Relevant action should be taken in these areas as well as in UDA.

Action needed: Notwithstanding the excellent higher educational facilities available in the area, the problem mainly results from its economic structure. The manufacturing of durables, in particular, required and attracted unskilled labor until the early 1950s. Action of immediate impact would be required in the Detroit Central City where the problem is more acute in order to provide the necessary orientation as well as the facilities for special short-term training courses. Longer term action would be required to supplement the first-aid relief facilities mentioned above and create the basis for therapy. Action should be coordinated with other programs which aim at the improvement of the physical structure of the central city since the program, in addition to providing the facilities to increase higher educational attainment, should also aim at attracting and keeping the educated in the area. Moreover, action under Programs S1 and S2 would provide a new basis toward higher educational standards in UDA.

Agents of action: Efforts aimed at raising educational attainment are being taken at various levels by both public and private corporations. Systematic and coordinated action with the necessary orientation would have to be undertaken by both groups with special emphasis on the amelioration of conditions in the city where the problem is more acute. A coordinating role in various educational programs, including community college efforts, is already being played by such agencies as the Southeast Michigan Council of Governments.

Phasing of action: This program should start immediately through short-term and long-term action, with intensive effort at the initial stages in order to face pressing human needs as well as to utilize all ongoing efforts.

Program S5

Problem: Decline of income in central areas.

Target: To reverse the trend of declining income in the central areas and thus contribute toward the overall effort for their economic revitalization under Programs S5-S8.

Levels of action: This problem mainly exists at the levels of central functions areas and cities, with specific reference to the Detroit Central City. Relevant action is required at the above levels as well as at the levels of subregions and UDA.

Action needed: The problem has been mainly caused by the flight of the middle- and high-income groups from the central areas and the high unemployment rates of the underprivileged low-income residents of these areas. Action would therefore have to be coordinated with other programs, such as S7 and S3, aiming at higher educational attainment and occupational orientation as well as with other measures related to the development of business activity in the central areas in an effort toward the reduction of unemployment and the increase of income for residents of these areas. Coordination with other programs for the physical revitalization of the central areas would also be fruitful as it would control the flight to the suburbs and at the same time attract high-income residents back to these areas.

Agents of action: Efforts to face this problem could be un-

dertaken by public and private organizations which would have to promote, coordinate and utilize the action of other relevant programs toward the solution of this problem.

Phasing of action: Action would have to be taken immediately through a short-term intensive effort at the initial stages to relieve human suffering where the problem is more acute. Longer term action would also be required to supplement the above relief effort with curative and preventive measures.

Program S6

Problem: Decline of retail sales in central areas.

Target: To increase the retail sales in central areas and thus contribute toward the overall effort for their economic revitalization under Programs S5-S8.

Levels of action: The problem exists at the levels of central functions areas and cities, with particular reference to the City of Detroit. Action should be taken at the above levels as well as at the levels of subregions and UDA.

Action needed: The problem has been caused by the physical decline of the central areas which led to the flight of the middle- and high-income groups to the suburbs and the decline of income in the central areas. The physical decline of the central areas and the development of regional shopping centers further reduced the attraction of CBD shopping both for suburbanites and city dwellers. The physical revitalization of the central areas, based on the Concept-Plan and the provision of better transportation facilities, would attract shoppers from the entire region and enable the respective central areas to recapture their proper share of business. This program would have to be coordinated with other relevant programs related to the development of the services sector and the overall economic and physical redevelopment of the central areas.

Agents of action: Action would have to be undertaken by both public and private organizations which would promote and utilize the benefits resulting from other relevant programs toward the solution of this problem.

Phasing of action: Long-term action should start immediately due to its key importance for the revitalization of central areas.

Program S7

Problem: Decline of other economic activities in central areas.

Target: To reverse the decline of economic activities in the central areas and thus contribute toward the overall effort for their economic revitalization under Programs S5-S8.

Levels of action: This problem exists at the levels of central functions areas and cities, with particular reference to the City of Detroit. Relevant action should be coordinated with other programs which aim at the economic and physical revitalization of the central areas.

Agents of action: Action would have to be taken by public and private organizations to coordinate and utilize the effort of other relevant programs toward the solution of this problem.

Phasing of action: Long-term action should start immediately due to its key importance for the revitalization of central areas.

Program S8

Problem: Decline of tax base in central cities.

Target: To face the declining tax base in the central cities and thus contribute toward overall effort for their economic revitalization under Programs S5-S8.

Levels of action: The problem exists at the levels of central functions areas and cities, with particular reference to the

City of Detroit. Relevant action should also include the subregions and UDA in addition to the levels where the problem exists.

Action needed: This problem culminates in the decline of population, income and economic activities in general within the central areas. Action should therefore be coordinated with the programs aiming at the reversal of these trends as well as with those aimed at the economic physical revitalization of the central areas. Relevant action could also be based on the decisions of government authorities in making reforms in the tax system.

Agents of action: Action would have to be taken by public organizations to promote, coordinate and utilize the efforts of other relevant programs which would contribute to the solution of this problem.

Phasing of action: Long-term action should start immediately with intensive effort in the initial stages.

Program S9

Problem: Economic segregation.

Target: To eliminate economic segregation and thus contribute toward the overall effort for economic and social integration under Programs S9-S13.

Levels of action: The problem mainly exists at the levels of central functions areas, cities and subregions. Relevant action should be taken at these scales as well as at the level of UDA.

Action needed: The problem refers to the isolation of the low-income residents of the central areas from the middle- and high-income groups living in the suburbs. Since this problem has mainly been caused by the physical decline of the area which led to the outward movement of the economically privileged groups from the center to the periphery of the metropolitan area, action should aim at the reversal of these trends. Action should therefore be coordinated with other relevant programs aimed at the improvement of conditions in the central areas and the creation of a pleasant urban environment together with all the high-order functions that only central areas can accommodate and offer. Such a revitalization would arrest the outward movement of the economically privileged groups and could even attract some high-income groups back to the central areas. Housing opportunities should also be made available to lower income groups in the wider region outside of the central areas to give the entire urban system physical as well as economic and social unity.

Agents of action: Action would have to be taken mainly by public agencies which would create the preconditions for the solution of this problem by coordinating, promoting and utilizing the benefits of programs aiming at the revitalization of the central areas.

Phasing of action: Action should be taken immediately with intensive effort at the initial stages to relieve pressing needs and also to coordinate and utilize all ongoing and new efforts relevant to this program.

Program S10

Problem: Racial segregation.

Target: To face the problem of racial segregation and thus contribute toward the overall effort for economic and social integration under Programs S9-S13.

Levels of action: The problem exists from the levels of neighborhoods up to the level of subregions where relevant action should primarily be taken.

Action needed: Specific measures to be applied will be determined by special studies of expert groups at various levels in connection with this problem. Generally, action should aim at the reduction of imbalances and disparities and the in-

crease of man's mobility in the urban system. The task is, of course, extremely difficult and should be pursued with caution and patience. The formulas to be considered should always aim at the reduction of conflicts and the improvement of communication and understanding among social groups. As the economic conditions of the less privileged groups improve and the economic gap is reduced, social taboos may have less relevance in the future. Action should also refer to the promotion, coordination and utilization of other programs related to the improvement of educational attainment, incomes, housing conditions, and of the physical environment in general. In this way the urban system could acquire physical, economic and social unity.

Agents of action: Action would have to be taken mainly by public agencies which could promote, encourage, coordinate and provide the necessary legislative framework for action under this and other relevant programs. The task should also, of course, be pursued by individuals and private organizations. Efforts are already being made, and coordination of relevant action would greatly contribute to finding a solution to this very difficult problem.

Phasing of action: Short- and long-term programs should start immediately. Short-term programs would aim at relieving human needs in the central areas. The problem, however, can only be solved through a long-term program. Intensive effort would be required at the initial stages to coordinate action under this and other relevant programs as well as to utilize all ongoing efforts.

Program S11

Problem: Increasing gap of choices between groups of people.

Target: To reduce and possibly eliminate the gap of choices between groups of people and thus contribute toward the overall effort for economic and social integration under Programs S9-S13.

Levels of action: The problem exists from the neighborhood level up to the level of UDA. Action should be taken at all these levels.

Action needed: Since the problem is caused by economic and social segregation as well as by the present transportation system, direct action would have to be coordinated with those programs which aim at the improvement of these conditions. Equal opportunity should be made available for all individuals and groups of individuals, with particular reference to housing.

Agents of action: Action should be taken mainly by public organizations to coordinate this program with efforts of other relevant programs so that the overall benefits could be utilized toward the solution of this problem. A specific regional authority which could have an impact on this program is the Southeast Michigan Transportation Authority.

Phasing of action: Short- and long-term programs should start immediately. Short-term programs would aim at relieving pressing needs in the central areas, while long-term programs should mainly aim at increasing the accessibility of all important locations by means of the proposed new transportation system and within the framework of the overall future development.

Program S12

Problem: Segregation of age groups.

Target: To face the problem of segregation of age groups and thus contribute toward the overall effort for economic and social integration under Programs S9-S13.

Levels of action: This program exists at the levels of central functions areas, cities and subregions where relevant action

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should primarily be taken.

Action needed: This program should aim at providing the facilities which would encourage families with children to live in the central areas, as well as the services which would cater to the younger generation. Such action would stimulate greater vitality in these areas and attract people of all age groups. The success of this program would depend on coordination with other relevant programs related to the economic and physical re-vitalization of the central areas.

Agents of action: Action should be taken primarily by public organizations which can promote and encourage this effort in coordination with other relevant programs related to the revitalization of the central areas. Important contributions should also continue to be made by the private sector through a variety of nonprofit as well as profit corporations.

Phasing of action: This is essentially a long-term program which should start immediately. Intensive effort would be required at the initial stages in order to utilize all ongoing efforts and secure coordination with other relevant programs.

Program S13

Problem: Other problems of social importance related to health, education and welfare.

Target: To provide social services for the above programs.

Levels of action: Other problems of social importance could exist from UDA down to the neighborhood level. Action should be taken at all these levels

Action needed: Action should refer to the provision of services such as public health, education and welfare, where needed, and should be coordinated with other relevant programs.

Agents of action: Action should be taken by relevant public organizations which should coordinate all ongoing efforts as well as private non-profit agencies.

Phasing of action: Short- and long-term action is needed with intensive effort at the initial stages, particularly in the central areas where such problems are more acute.

Program P1

Need: To coordinate UDA's land connections with its wider region.

Target: To establish a new system of basic land transportation axes connecting UDA with its wider region on the basis of the requirements created by the emerging megalopolitan developments in the Great Lakes area and by the anticipated technological evolution in land transportation.

Levels of action: Coordination should be effected at the national and international levels as well as at the levels of the Great Lakes megalopolis and UDA.

Action needed: The basic transportation axes of regional, national and international importance proposed in the Concept-Plan should be reviewed and discussed with representatives of the federal governments of the United States and Canada in order to reach an agreement on the future major transportation corridors. On the basis of such an agreement the regional axes will be defined at the Great Lakes megalopolis and UDA levels.

Agents of action: The Department of Transportation of the United States and the departments of state highways of Michigan and Ohio along with the corresponding authorities in Canada should undertake the responsibility for this program. The Southeast Michigan Council of Governments may play an important role through a contractual relationship with the State Highway Department of Michigan with reference to planning the axes in their area.

Phasing of action: This program is of key importance for future development according to the Concept-Plan and should

therefore be considered of high priority.

Program P2

Need: To coordinate UDA's utility networks with those of the wider region.

Target: To establish a system of basic utility corridors connecting UDA with its wider region and thus create a framework for the internal organization of networks within UDA itself.

Levels of action: Coordination of utility networks should be achieved at the national and international levels as well as at the level of the Great Lakes megalopolis and UDA.

Action needed: Action should aim to define basic utility corridors in relation to the physical structure of the wider area and its anticipated development. This effort should be further coordinated with the corresponding land transportation program (Program P1) on the basis of common all-utility corridors.

Agents of action: Public agencies and private utility companies can play an important role in this effort. From the point of view of public agencies, the Federal Power Commission and the Department of Housing and Urban Development would be concerned at the federal level in the United States. The states of Michigan and Ohio would also be involved in cooperation with organizations like the Southeast Michigan Councils of Governments. The corresponding authorities in Canada should also be associated with the effort at all the above scales.

Phasing of action: Due to its key importance for the realization of the development pattern envisaged by the Concept-Plan, this program should be given high priority.

Program P3

Need: To strengthen the connections of western Michigan and the Upper Peninsula with UDA.

Target: To establish a new system of transportation links between UDA and western Michigan ensuring de-localization of the urban centers existing there. The same should be done for the Upper Peninsula in order to increase the economic interaction between this area and southern Michigan.

Levels of action: This should be undertaken at the level of the State of Michigan.

Action needed: Action should be closely coordinated with program P1 so that axes deriving from broader regional considerations, as provided by the Concept-Plan, can be used in the best way for connecting UDA with the rest of Michigan. Furthermore, measures should be studied to improve the economic interaction of UDA with these areas benefiting from the improved physical connections between them.

Agents of action: An important role could be undertaken by the Michigan State Highway Department in collaboration with the Upper Great Lakes Regional Commission, the Upper Peninsula Committee on Area Problems (UPCAP) and Operation Action U. P.

Phasing of action: Action under this program will facilitate the development of the basic transportation axes of UDA and will counterbalance the increasing influence of Chicago on western Michigan and the Upper Peninsula. For these reasons this program should be given high priority.

Program P4

Problem: Limited development of water transportation.

Target: To expand the development of water transportation in UDA.

Levels of action: Water transportation in the Great Lakes refers to the whole Great Lakes region involving both the

United States and Canada, and therefore, its development should be faced mainly at these levels. Action should also be taken at the levels of UDA and the subregions within the framework of the general policy adopted at higher levels.

Action needed: The most basic aspects associated with this program refer to the extension of the navigational period and the improvement of navigation in the Great Lakes to serve large ocean-going vessels and thus increase the competitiveness of waterborne transportation versus other modes of transportation. The prospects of such development will define the type and location of ports to be developed in UDA. However, even on the basis of conservative expectations, an improvement of existing facilities as well as the creation of new ones to serve the new twin urban center should be programmed to meet future needs in UDA.

Agents of action: The International Joint Commission (United States and Canada) would be involved with the overall problem of water transportation in the Great Lakes area. The departments of Commerce and Natural Resources of the State of Michigan with the collaboration of the U.S. Army Corps of Engineers could undertake action at the UDA level. Implementation at lower levels would involve local governing bodies, with the Southeast Michigan Transportation Authority in the role of coordinator. An important role could also be played at the lower levels by private institutions such as the Lake Carrier's Association.

Phasing of action: Development of water transportation will follow a long-term process. However, intensive effort should be initiated at the first stages of the implementation in order to achieve a balanced overall development within the framework of the Concept-Plan.

Program P5

Problem: Inadequate facilities to meet new demands in air transportation.

Target: To develop additional facilities in order to cover the new demands both by increasing volumes of traffic and by improved technology in air transportation; also, to make UDA an air transportation center of regional importance.

Levels of action: Action should be organized and guided at the UDA level. The collaboration and support of authorities at higher levels should be obtained since the development of major airport facilities, particularly those capable of handling supersonic transports, should be seen within the organizational structure of future air aviation at the levels of the United States and the Great Lakes megalopolis. Moreover, action is also needed at the level of subregions for the improvement of existing facilities and the development of metroports.

Action needed: The concept and location of a new major airport in UDA should be promoted, and a decision should be taken in relation to the long-term development perspectives in the Great Lakes megalopolis and the future development in UDA. Action should also refer to the improvement of existing facilities and the creation of metroports in relation to the future development of the area envisaged in the Concept-Plan.

Agents of action: The primary role would be that of the Michigan Aeronautics Commission with the assistance of the Federal Aviation Administration for coordination at the national level. Local governing bodies such as the Wayne County Road Commission will be involved in the implementation. The organizational setup for this program should be further studied.

Phasing of action: Action in connection with the development of a major airport in view of the anticipated developments in supersonic aviation should be initiated immediately so that the area will be ready to assume an important role in future air transportation. The parallel development of lower order facilities should be organized with a long-term program which will facilitate the balanced development of UDA according to the Concept-Plan.

Program P6

Need: For a new organization of the land transportation system in UDA.

Target: To create a new system of internal land transportation in UDA on the basis of the requirements for better connections with the wider region; also, reorganization of urban development within UDA.

Levels of action: This program would aim to organize the land transportation system of UDA in accordance with the basic development pattern envisaged in the Concept-Plan. Such organization could be undertaken at the UDA level, and particularly by the states of Michigan and Ohio as well as the Province of Ontario. Authorities at the level of subregions as well as at lower levels would also be involved in the implementation of this program.

Action needed: The organization of the new system will be made within the framework of the basic national and international axes to be established through Program P1. The basic step to ensure this organization would be the acceptance of the regional axes proposed, followed by a study of their alignments and the initiation of the process to acquire the necessary rights-of-way. The acquisitions of rights-of-way should be coordinated with Program N2. All relevant ongoing programs should be coordinated within the framework of the new physical structure, and the implementation of new programs should be planned in view of the introduction of new means of transportation. A parallel effort should be made to adjust the existing networks to the new structure, wherever possible.

Agents of action: The basic role could be undertaken by the Michigan State Highway Department and corresponding authorities in the State of Ohio and the Province of Ontario. At lower levels the implementation would be undertaken by local governing bodies coordinated by the Southeast Michigan Council of Governments as well as similar organizations which exist or may be created in other areas of UDA.

Phasing of action: The establishment of the basic regional axes is of key importance for the future development of UDA according to the Concept-Plan. Action in this connection should therefore be initiated immediately. Once the basic structure of the network is established, construction could be phased according to the anticipated evolution of the overall growth of UDA.

Program P7

Need: To coordinate utility networks within UDA.

Target: To face the above need.

Levels of action: Coordination of utility networks within UDA should be attempted at the UDA level since most of the networks are related to this area as a whole. Implementation could take place at the level of subregions and cities.

Action needed: The first step is to decide on a system of utility corridors in which the development of utility networks could be coordinated according to the Concept-Plan. Such utility corridors should be seen in connection with the land transportation networks on the basis of common all-utility corridors combined with transportation axes. The land acquisition related to these corridors should then be coordinated with Programs N2 and P6. An attempt should also be made to adjust, wherever possible, the existing networks to the new physical structure.

Agents of action: The contribution of private utility companies is of vital importance both to the conception of the system of utility corridors as well as to its actual implementation.

The coordination of action at the state level must be studied. At the subregional level, the Southeast Michigan Council of Governments and other similar organizations which exist or may be created in the future could provide considerable assistance to the implementation of the program. At the local level, public utility companies will be involved with implementation in collaboration with local governing bodies.

Phasing of action: The establishment of utility corridors is of key importance for the implementation of the Concept-Plan and should be given high priority. This will ensure a coordinated expansion of each particular utility network throughout the development period.

Program P8

Problem: Disorganized expansion of urban centers in UDA.
Target: To create a new system for the organization of new urban development.

Levels of action: Expansion should be organized in each particular urban center of UDA, but this can only be achieved by action at the levels of subregions and UDA, which would create the proper frame for organized development.

Action needed: The new land transportation and utility corridors envisaged in the Concept-Plan would create the basic framework for organized expansion of the urban centers. In addition, action should be taken to create new centers at the nodal points of the major transportation axes which would act as forces of attraction for future development in organized predetermined directions. Action toward the creation of the new twin urban center in St. Clair County and of the new cities proposed by the Concept-Plan is of paramount importance for the success of this program. To this end, the possibility should be examined of using existing legislation to acquire land around these nodal points as well as along transportation axes in order to ensure control of land uses and thus facilitate organized development in the future. This effort should be combined with the re-vitalization and restructuring of existing centers to facilitate their development and ensure the balanced growth of the entire urban system.

Agents of action: Action should be undertaken mainly by public agencies which will provide the necessary planning and programming. At the UDA level, the State of Michigan could initiate and organize the overall effort and set up a framework of action for councils of governments, county planning commissions and local governing bodies at lower levels. The State could also seek the assistance of federal authorities, such as the Department of Housing and Urban Development, for the creation of new urban centers.

Phasing of action: This program is of key importance to the implementation of the Concept-Plan and should therefore be initiated immediately to coordinate all ongoing efforts.

Program P9

Problem: Inadequate functioning of the Detroit Central City.
Target: To improve conditions in the city and ensure its revitalization to the level pertaining to its role as the most important part of UDA.

Levels of action: The problem should be faced in the Detroit Central City and its Central Functions Area, as well as at the levels of UDA and the Central Region. The latter's disorganized development is one of the main causes of the problem.

Action needed: In addition to action which should be taken at the higher levels of UDA and the Central Region, which, through the implementation of the overall proposals of the Concept-Plan, aims at reorganizing the whole system, action should also be taken in the city itself. This action is expressed in the Concept-Plan for the city and can be summarized as

follows: adequate connections of the city and its CBD with the overall system; reorganization of the internal structure and function of the city on the basis of a system of communities, self-contained and adequately equipped with necessary facilities; remodeling of the critical areas of the city. This action should be closely coordinated with the other measures in Programs S5-S10, the aim of which is to support the city's revitalization from the socio-economic points of view.

Agents of action: Action under this program should be undertaken primarily by public agencies at the federal, state and local levels.

Phasing of action: Action should be initiated immediately since the revitalization of the Detroit Central City is of key importance for the implementation of the Concept-Plan.

Program P10

Problem: Poor housing conditions in the central cities.
Target: To improve housing conditions in central cities.

Levels of action: This problem exists at levels from single dwellings to cities, and action should be taken at all these scales. At the higher levels, action is needed to guide and coordinate residential development at lower levels.

Action needed: Action would refer to the improvement, full utilization, and renewal of existing housing stock. Special relief measures should be taken in communities where acute problems exist. Improvement of housing conditions should be closely coordinated with the overall improvement and organization of communities provided for in Program PII so that a balanced overall development at the community level could be achieved. Special measures for the provision of low-income housing should be studied. Housing opportunities for low-income families should be increased in the central cities and in other locations of the region in order to offer choices to these families and to facilitate the integration of income groups.

Agents of action: Action should be localized and placed under responsibility of public agencies, such as the Detroit City Plan Commission and the Detroit Housing Commission. Housing corporations and private developers could contribute to the implementation process. This action should be coordinated within the framework of a general policy and with assistance from higher level authorities such as the Department of Housing and Urban Development, Federal Housing Administration, Federal National Mortgage Association and the Department of Health, Education and Welfare at the federal level. At the state level, public agencies such as the Michigan Department of Community Affairs could contribute to this effort. At the subregional level, the Southeast Michigan Council of Governments and similar organizations in other parts of UDA should be involved in the coordination of programs. On the basis of defined communities, the residents could then develop their own leadership. Local governments should entrust to them the creation and implementation of plans and programs of community importance.

Phasing of action: Immediate action is needed to relieve human suffering in those areas where the problem is more acute. An intensive effort should be made to coordinate ongoing and new work within an overall long-term program aiming at the improvement of existing conditions and organized residential development in the future.

Program P11

Need: For community organization.
Target: To reorganize the central parts of existing urban areas on the basis of communities equipped with all necessary facilities in order to ensure their proper functioning and revitalization; also, to organize all future development on the ba-

sis of a hierarchical community structure.

Levels of action: The problem exists in small and large communities, from the level of small neighborhoods to that of the city. Action should be taken in all these scales.

Action needed: Action can start in the most critical area of UDA, the Detroit Central City, on the basis of the relevant proposals of the Concept-Plan. Parallel action could start in other central areas on the basis of the same principles which aim at creating self-contained communities within which the residents could have a sense of identity. This could be accomplished through rearrangement of traffic patterns, creation of local centers, a balanced system of community facilities, proper land use and zoning, a variety of residential types, and balanced residential areas with regard to age groups, household structure, income and race. Action in this connection should be coordinated with other programs which deal with some of these aspects more specifically.

Agents of action: Both public agencies and private organizations would be involved in the implementation of this program. Public agencies would have the primary role of planning in general as well as providing the required public services at each level. Other services, such as those related to utilities, could be developed by the private sector. In general, the private sector of local business and residents could play an important role for the success of this program.

Phasing of action: Immediate action is required in those communities where the problem is more acute. The general improvement of existing conditions as well as the proper organization of future development should be coordinated within a long-term program. Intensive effort should be made at the initial stages in order to utilize and coordinate work presently being undertaken to meet such needs.

Program P12

Problem: Inadequate functioning of the CBDs of central cities.

Target: To revitalize and remodel the existing CBDs.

Levels of action: Action should be taken in each CBD and coordinated with programs aiming to improve the wider areas which contain them, i.e., the cities and the subregions.

Action needed: Guidelines for action to be taken within the CBDs are demonstrated by the Concept-Plan for the reorganization of the Central Functions Area of Detroit. This action can be summarized as follows: reorganization of all the functions and land uses; reorganization of the internal physical structure through the application of the concept of superblocks; encouragement of residential development to promote the CBDs' vitality after office hours; reorganization of the internal transportation system with the aid of new systems for internal circulation (center systems); complete separation of pedestrian and vehicular movements through the creation of a two-level system; elimination of open parking lots and provision of additional parking facilities in multilevel garages. This action should also be coordinated with measures proposed by Programs S5-S10, which aim at the improvement of socio-economic conditions within the CBDs.

Agents of action: The implementation of this program could be undertaken by public agencies at the local level such as the Detroit City Plan Commission and the Detroit Housing Commission. Action at the local level could be fostered at higher levels by public agencies, such as the Michigan Department of Community Affairs at the state level, and the Department of Housing and Urban Development at the federal level. The Central Business District Association and other major downtown organizations could support government programs and take the initiative of implementing programs within their capacity.

Phasing of action: Action should start immediately to face pressing needs and to supplement and coordinate ongoing efforts. Intensive effort would be needed at the initial stages of this program, though its complete implementation should be considered medium-range.

Program P13

Problem: Lack of adequate safety and security in the central areas.

Target: To effect a higher measure of safety and security in the central areas.

Levels of action: This problem mainly exists from the level of the small neighborhood up to the city level. Relevant action should be taken at these scales.

Action needed: As part of the general measures being taken to reduce crime, lighting and policing should be increased in the central areas especially after dark to provide immediate relief. The problem, however, should be faced more radically by restoring the continuity of the physical structure of these areas, which could then be patrolled more effectively by a smaller police force. Action should also be coordinated with measures included in other programs aimed at promoting the vitality of central areas even after work hours.

Agents of action: Public agencies would have the responsibility of action under this program with the collaboration of private organizations and private citizens.

Phasing of action: Immediate action is needed, with intensive effort at the initial stages to relieve urgent needs. Longer term action would be related to the general revitalization of the central areas and should be coordinated with the phasing of other relevant programs.

Program P14

Problem: Loss of human scale.

Target: To restore the human scale in existing and new urban developments.

Levels of action: This problem exists mainly from the level of the dwelling group to the level of the Central Functions Area. Relevant action should be taken primarily at these scales.

Action needed: In existing communities and in creating new settlements, action should be focused on restoring the necessary continuity of built-up space and its balanced relationship to open space, both essential elements of an attractive urban environment. The residential structures should be planned in a way which would increase man's contact with his natural and social environment. Moreover, action should deal with the separation of the pedestrian from the automobile which could be placed at different levels in the central areas.

Agents of action: Action should be taken primarily by public agencies at the local level with the collaboration of private organizations and residents.

Phasing of action: Action should be taken immediately with intensive effort at the initial stages in order to face pressing needs in existing central areas.

Program G1

Need: To ensure coordination of development at the Great Lakes megalopolis level.

Target: To create a mechanism to effect the above coordination.

Levels of action: Action should be taken at the Great Lakes megalopolis level through combined efforts of all urban areas within the Great Lakes megalopolis with the support of federal authorities. Urban areas such as the UDA have a direct interest in achieving coordinated action with other similar areas

as this would provide a proper frame for their internal development.

Action needed: At the initial stages, the required coordination can be effected through the leadership of existing bodies which operate in the area. At later stages, however, and as the need arises, a more systematic coordination can be achieved through proper representation of all interested parties in a coordinating agency. This agency might eventually develop into a more powerful organization with direct responsibilities for implementation. The creation of a Great Lakes megalopolis authority, although it might be considered as the most effective measure for coordination in the long run, is not. practical under present conditions and could be seen only in the frame of a general reform of the administrative structure.

Agents of action: Action should be taken by public agencies of the states within the Great Lakes area as well as by the private organizations with overall interests for the future of this area.

Phasing of action: Action should start immediately and particular attention should be given to the coordination and utilization of ongoing efforts related to this program.

Program G2

Need: To coordinate activities related to the overall development in UDA.

Target: To create an agency to effect the above coordination,

Levels of action: Action should be taken at the UDA and state levels through the combined efforts of all regional authorities and organizations acting in this area.

Action needed: The procedure at the initial stages would be to seek the needed coordination of development in UDA through the states involved and the leadership of existing authorities and organizations at lower levels. A parallel effort would be to create types of new organizations similar to the Southeast Michigan Council of Governments in the area of UDA where such organizations do not exist. In connection with this effort, the UDA should be divided into a number of areas, each having a functional entity within the frame of the Concept-Plan. Following this first step, the effort should proceed with the organization of a coordinating agency through proper representation of the regional bodies involved. The experience which will be gained and the needs encountered in the course of UDA development will show at later stages whether this agency should be further developed into a more powerful entity with more direct responsibilities for implementation.

Agents of action: Action should be taken mainly by public agencies and particularly by the State of Michigan in collaboration with the State of Ohio and the Province of Ontario, which could utilize relevant ongoing efforts of government authorities as well as private corporations interested in the future of UDA.

Phasing of action: Action should be initiated immediately with intensive effort at the initial stages because of the key importance of coordination in the implementation of the Concept-Plan.

Program G3

Need: For an overall development plan and program for UDA.

Target: To face the above need.

Levels of action: Action should be taken at the UDA level.

Action needed: The optimum development pattern for UDA should be agreed on and accepted as the one meeting the long-term perspectives for the development of this area with-

in its wider region. Detailed plans and programs based on the overall Concept-Plan should then be formulated, utilizing relevant work that has already been made at various levels. The follow-up of the implementation process should also be organized to provide for the continuous adjustment of these plans and programs according to actual development.

Agents of action: Action should be taken by the states of Michigan and Ohio as well as by the Province of Ontario in collaboration with regional authorities and organizations. An active role mainly related to the follow-up of implementation should later be undertaken by the UDA agency proposed for the coordination of regional bodies.

Phasing of action: Action should be initiated immediately, and intensive effort should be made at the initial stages in order to create the foundations for all subsequent actions of implementation.

Program G4

Need: For subregional plans and programs. *Target:* To face the above need.

Levels of action: Action should be taken at the level of subregions.

Action needed: On the basis of the overall development plan for UDA, detailed plans and programs should be prepared for all subregions. Adjustments of these plans and programs should consequently be made as the need arises in the course of the development.

Agents of action: Action should be taken mainly by public agencies in each subregion, which should utilize relevant ongoing efforts of government authorities as well as private corporations interested in the future of the respective subregions.

Phasing of action: This is a long-term program which should start immediately in parallel to Program G3 related to the overall plan and program for UDA.

Program G5

Need: For local plans and programs for developing areas. *Target:* To face the above need.

Levels of action: Action should be taken from the level of the neighborhood up to the cities and subregions.

Action needed: Action should be mainly taken to provide properly planned growth for those areas which are now entering the process of urbanization and are not extensively developed so as to preclude effective planning. Such action should, of course, be coordinated with the respective regional plans and with the overall plan for UDA. For the developed areas, action should concentrate on adjustment of plans and programs, where needed, to cover the requirements of the Concept-Plan.

Agents of action: Action would have to be taken by public agencies at the local level in coordination with higher level authorities.

Phasing of action: Action should be initiated immediately in parallel with relevant efforts at the higher levels.

The key programs

This study, moving in a systematic way from problems to programs, has presented the 40 main problems of UDA, indicated how these problems are dealt with by the Concept-Plan and outlined the general characteristics of 40 main programs to face the problems.

Each of these programs is related to a specific problem, but also forms an integral part of the overall program through which the overall organization of future development in UDA could take place according to the Concept-Plan. It has been

The 5 Key Programs

EKISTIC UNITS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
DESIGNATION OF UNITS AND CORRESPONDING STUDY AREAS	MAN	ROOM	DWELLING	DWELLING GROUP	SMALL NEIGHBORHOOD	NEIGHBORHOOD	SMALL TOWN	TOWN	LARGE CITY	METROPOLIS	CONURBATION	MEGALOPOLIS	URBAN REGION	URBANIZED CONTINENT	ECUMENOPOLIS	PROBLEMS AFFECTED BY EACH OF THE KEY PROGRAMS
								CBD's	CITIES	SUB-REGIONS	UDA	GLM	USA AND CANADA			
COMMUNITY CLASS / MAIN PROBLEMS & NEEDS				I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	

NATURE — Natural Environment

- N1 UNFAVORABLE CLIMATE IN GLM
- N2 DESPOLIATION OF LAND RESOURCES AT ALL SCALES
- N3 LACK OF RECREATIONAL AREAS AT ALL SCALES
- N4 POLLUTION OF WATER AT ALL SCALES
- N5 POLLUTION OF AIR AT ALL SCALES

MAN — Demography

- M1 GROWTH RATES IN GLM AND UDA FALLING BELOW NATIONAL AVERAGE
- M2 DECLINING GROWTH RATE IN CENTRAL REGION
- M3 DECLINING POPULATION IN CENTRAL AREAS

SOCIETY — Socio-Economic Structure

- S1 HIGH RELIANCE OF UDA ECONOMY ON A SINGLE SECTOR
- S2 UNDERDEVELOPED SERVICES SECTOR IN UDA
- S3 LOW PERCENTAGE OF WHITE COLLAR WORKERS IN UDA
- S4 LOW EDUCATIONAL ATTAINMENT IN CENTRAL REGION
- S5 DECLINE OF INCOME IN CENTRAL AREAS
- S6 DECLINE OF RETAIL SALES IN CENTRAL AREAS
- S7 DECLINE OF OTHER ECONOMIC ACTIVITIES IN CENTRAL AREAS
- S8 DECLINE OF TAX BASE IN CENTRAL AREAS
- S9 ECONOMIC SEGREGATION
- S10 RACIAL SEGREGATION
- S11 INCREASING GAP OF CHOICES BETWEEN GROUPS OF PEOPLE
- S12 SEGREGATION OF AGE GROUPS IN CFA
- S13 OTHER PROBLEMS OF SOCIAL IMPORTANCE

NETWORKS — Physical Structure

- P1 NEED TO COORDINATE UDA'S LAND CONNECTIONS WITH ITS WIDER REGION
- P2 NEED TO COORDINATE UDA'S UTILITY NETWORKS WITH THOSE OF THE WIDER REGION
- P3 NEED FOR BETTER CONNECTION OF WESTERN MICHIGAN AND THE UPPER PENINSULA WITH UDA
- P4 LIMITED DEVELOPMENT OF WATER TRANSPORTATION
- P5 INADEQUATE FACILITIES TO MEET NEW DEMANDS OF AIR TRANSPORTATION
- P6 NEED FOR NEW ORGANIZATION FOR THE LAND TRANSPORTATION SYSTEM IN UDA
- P7 NEED TO COORDINATE UTILITY NETWORKS WITHIN UDA
- P8 DISORGANIZED EXPANSION OF THE URBAN CENTERS OF UDA
- P9 THE DETROIT CENTRAL CITY SUFFERS AS THE CENTER OF A DISORGANIZED SYSTEM

SHELLS

- P10 POOR HOUSING CONDITIONS IN CENTRAL CITIES
- P11 NEED FOR COMMUNITY ORGANIZATION
- P12 INADEQUATE FUNCTIONING OF THE CBD'S OF CENTRAL CITIES
- P13 LACK OF SAFETY AND SECURITY IN THE CENTRAL AREAS
- P14 LOSS OF HUMAN SCALE

GENERAL — Institutional Structure

- G1 NEED FOR A GLM AGENCY
- G2 NEED FOR A UDA AGENCY
- G3 NEED FOR AN OVERALL DEVELOPMENT PLAN AND PROGRAM FOR UDA
- G4 NEED FOR SUBREGIONAL PLANS AND PROGRAMS
- G5 NEED FOR LOCAL PLANS AND PROGRAMS FOR DEVELOPING AREAS

Totals: 32   27   27   29   12

NOTE: Generally the problems listed above are related to the physical elements of the settlements. Thus, under Society, only those socio-economic problems related to physical structure are included.

- ● Units Where Problem Exists
- ○ Units Where Problem Is Generated
- ◯ Units Where Action Should Be Taken

- A Revitalization Of The Existing Central Cities
- A* Creation Of The New Twin Urban Center
- C Creation Of The Proposed New Cities
- D Development Of The New Transportation System
- E Creation Of A Better Natural Environment

Fig. 14: The five key programs.

repeatedly emphasized that all 40 programs should be initiated immediately in order to achieve a balanced overall development in UDA.

Action under each program will be directed toward a specific target, defined for every program in relation to the particular problem to be faced. The overall effort, however, will be directed toward the overall target, which is the implementation of the Concept-Plan and the gradual elimination of all problem areas. It is, therefore, important to specify this overall effort in order to provide clear guidelines for implementation and facilitate the coordination of relevant action. In this connection, the success of the overall effort can be based on a limited number of key programs, the parallel initiation of which will lay the foundations toward the achievement of the overall goal. These key programs are:

• Revitalization of the central cities of existing metropolitan areas.
• Creation of the new twin urban center in St. Clair County.
• Creation of the proposed new cities throughout UDA.
• Development of the new transportation system in UDA.
• Creation of a better natural environment through the reservation and development of a network of recreational areas.

Each of these key programs consists of activities included in several of the 40 main programs. On the other hand, the realization of each of these key programs would contribute to the solution of many of the 40 main problems, as illustrated in figure 14.

The key program referring to the revitalization of central cities contributes to the solution of 32 of the 40 main problems. The contribution is mainly related to problems of natural environment, demography and socio-economic structure, and less to problems related to the physical structure. The key program referring to the creation of a new twin urban center contributes to the solution of 27 of the 40 main problems. Its contribution is mainly related to problems of natural environment and physical structure and to a lesser degree to

problems of socio-economic structure. The key program referring to the creation of new cities also contributes to the solution of 27 of the 40 main problems. The key program referring to the creation of a better natural environment contributes to the solution of 12 of the 40 main problems. Its contribution is mostly related to problems of natural environment and demography. It must be clarified here that although this last key program affects directly only 12 of the 40 main problems, it is considered of primary importance due to the significance that the quality of natural environment has acquired in affecting the growth potential of an area.

The above analysis indicated the significance of each of the key programs. It should, however, be stressed that although the five key programs are instrumental in the realization of the Concept-Plan, each key program, on its own, cannot lead to the successful implementation of the plan, and it may in fact eventually intensify existing problems. Even if two or three of the key programs were implemented, a balanced development could not be achieved unless all five key programs were successfully carried out. Thus, if it were possible to revitalize the central cities without implementation of the other key programs, this revitalization would generate a strong attraction for the accumulation of new forces in the revitalized cities and would eventually lead to a new cycle of deterioration. Conversely, if the effort is concentrated on the creation of new cities only, without any revitalization of the existing ones, the new centers would grow to the detriment of those already existing. Similarly, if a new transportation system is developed without provision for new urban centers, the new system would simply facilitate the exodus of people from the existing cities and result in further disorganized sprawl.

It is evident, therefore, that if each of the above five key programs is important for the future development of UDA, their parallel implementation and complete coordination is more than vital. This study has sought to make a meaningful contribution to this effort.

International Conference on Water for Peace, showing Doxiadis with President Lyndon B. Johnson, U.S. Interior Secretary Stewart Udall, Philippine representative Carlos Romulo, et al., Washington, DC, USA, 23 May, 1967. (*Source:* © Constantinos A. Doxiadis Archives of the Constantinos and Emma Doxiadis Foundation).
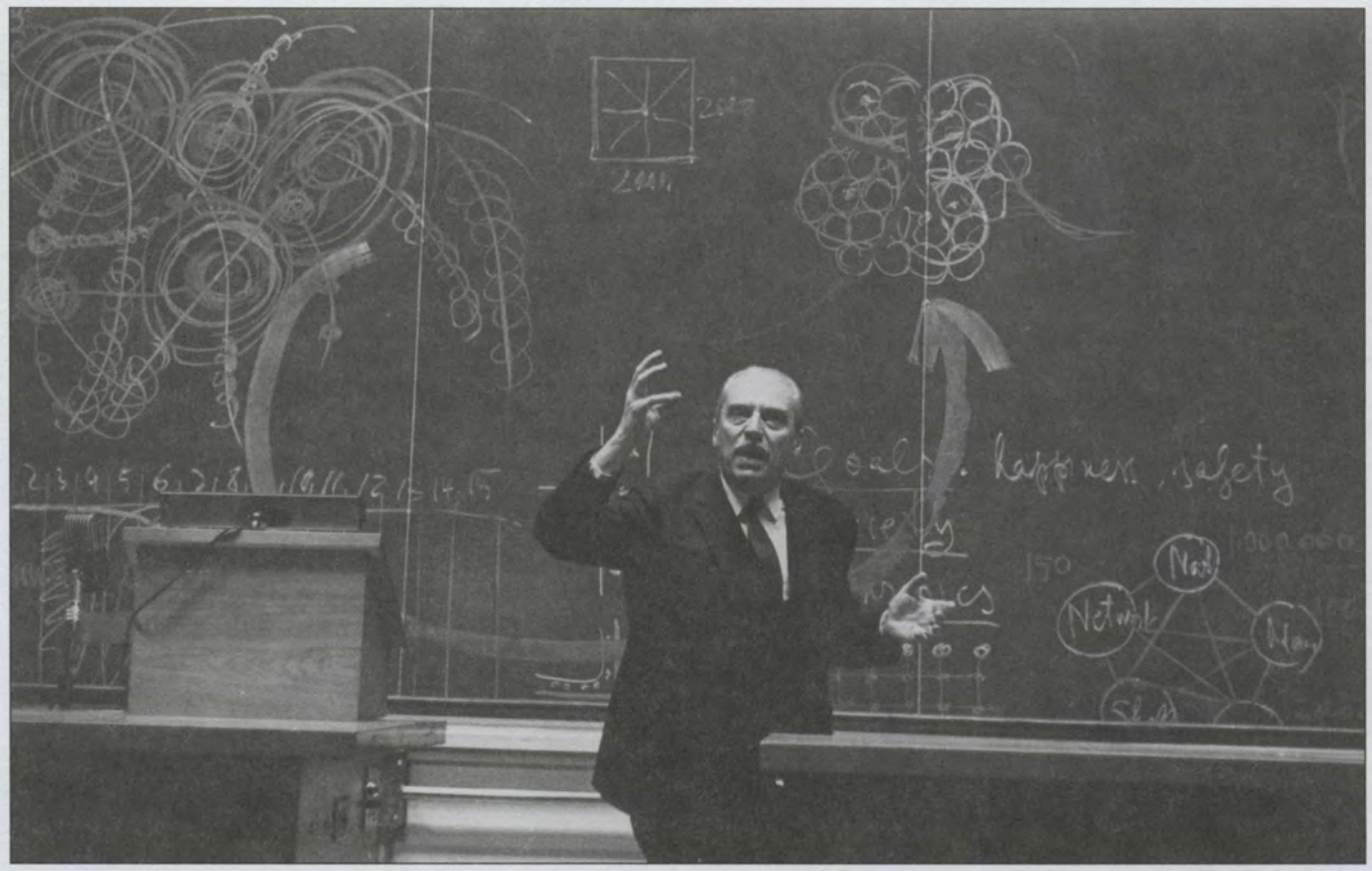
C.A. Doxiadis lecturing at the Harvard Graduate School of Design Lecture Series, 8 February, 1967. (*Source:* P. Hollander, Harvard University, Graduate School of Design).

The emerging Great Lakes Megalopolis

Preface

WE COMPLAIN about our cities – and justifiably so. For in spite of the much higher incomes and the much more developed technology which the present generation has in relation to those who lived before the eighteenth century, our present cities have not been able to serve us as well as did the cities of the past. Our admiration for the cities of the past is partly because of the better way of living they represented.

Although we complain about the cities of the present, we continue to build in the image of existing cities, and to produce mere expansions of them. Instead of solving any problems, we create situations which worsen with every day that passes. The reason is that we do not have the ability to look ahead and see the cities in which we will live in the future which in reality are the cities we are building today.

In order to escape this impasse of building the cities of the future, which in reality are the cities we are building today, ability to foresee the types of cities in which we shall have to live and try to do our best for them. This requires a twofold approach. First, we must realistically determine those basic characteristics of the cities to come which will be inevitable; and second, we must invent the type of life we want to carry out inside these cities and form the cities accordingly.

The first part of this approach is based on the idea that there are forces beyond man's control, at least in the short term of a generation or two, such as the demographic forces. No policy on population control will have so great impact as to change the basic dimensions of population growth in the next few years. Neither can we control the forces leading towards greater development of resources and greater productivity. These forces are leading, as they have throughout history, to the creation of greater and greater urban concentrations, greater and greater human settlements.

In order to be able to create a better city for the future, we must first try to understand where the inevitable forces of development and evolution are taking the human settlements and then see how we can build better settlements within the frame which is being created. We must study those settlements which are to come, which we may not be able to see yet, but whose foundations have already been laid. Such settlements are the forthcoming megalopolises, the urban concentrations which comprise within them several metropolitan areas and several other minor settlements interconnected in a system which is be-

ginning to operate as one.

Such megalopolises are necessarily inevitable, not only because of a growing population, but also by the new means of transportation which will allow people who, two centuries ago, commuted on foot only for ten minutes a day in each direction, one century ago commuted by train for as much as half an hour a day in each direction, and today commute as much as one hour in each direction by several means of transportation over a distance of 40 or 50 miles, to commute in the future beyond the 100-mile radius. New means of transportation will make this possible in no more than one hour. If we project the increasing speeds properly, we shall see that the dimensions of our settlement reach from the one-mile diameter common before the eighteenth century to several miles in the nineteenth, several tens of miles in the twentieth century, and probably several hundreds of miles at the beginning of the twenty-first century.

The large megalopolises of the future will differ from the cities we now know in many other ways besides size: there will be a much greater complexity of interrelations between their constituent parts, a very different conception of function and life within them and a different conception of spatial configuration and use of land, and so forth. All this will be made possible by greatly increased income and economic potentialities, by new technologies, greatly expanded automation and communications, and the availability of information, and by much more efficient overall planning technologies. Within this whole picture, however, transportation aspects will undoubtedly retain a central position, conditioning the structure and operation of these large future megalopolises to a very high degree.

Introduction

The concept of megalopolis

The second third of our century will probably be regarded as an important period in the history of the evolution of human settlements because it saw, for the first time, the emergence of a new type of settlement, the megalopolis. This new type of settlement is characterized by its large size in area and population, its high regional densities, the inclusion in it of several large centers strongly interacting with each other and with the surrounding region, and also the introduction of new and more complex patterns of life. The characteristics of the megalopolis, however, are not yet sufficiently well defined and considerable further research will be needed before they can be properly identified.

A study by the Athens Center of Ekistics, Athens Technological Institute, called the City of the Future Research Project, has already provided some global data on this new form of human settlements. This study has shown that megalopolises may be expected to grow, in number as well as in size and complexity, at an increasing rate in the near future.

According to the population projections worked out by the Athens Center of Ekistics, during a period somewhere in the first half of the twenty-first century, most probably towards the end of the first quarter of the twenty-first century, the proportion

of the earth's population residing in megalopolises is expected to reach its maximum, almost half of the earth's population then constituting megalopolitan population. The importance of megalopolises will have grown to such a degree as to justify for this period the term "the Era of the Megalopolis."

At the same time, however, larger units, such as urbanized regions, urbanized continents and, finally, the universal city or Ecumenopolis, will start emerging and will gradually replace the current type of megalopolis. Megalopolises will continue growing both in size and in number but, because of space limitations on the earth and the necessity of interconnection between megalopolises, more and more of them will start merging into each other giving birth to larger complexes of a higher order, consisting of several interconnected megalopolises. Because of this merging the number and importance of "plain megalopolises" will start diminishing after the previously mentioned maximum is reached.

Possible alternative definitions of megalopolises

Because of their complexity and variety, megalopolises lend themselves to the development of a considerable range of alternative definitions, each based on a different type of criterion. Whether in the end one would have to choose just one of these alternative simple definitions and establish it as the main one or combine several simple definitions into a multiple one remains to be seen from the development of our knowledge about megalopolises. Possible definitions can be classified as follows:

● **Simple definitions:** These are definitions using one single criterion.

• *Structural definitions:* The criterion in this case refers to the structure of the area. It might for example be the range for the

population size, the area, the density or other defined variable or a more complex criterion, such as the connectivity between major centers, that can be regarded as a function of the size and distance of the corresponding centers.

• *Functional definitions:* The criterion on which such definitions are based is related to the functions within the area. Among the more characteristic criteria of this type are the overlapping movements (transportation), various types of interactions, economic activities, administrative aspects, and so forth.

• *Growth definitions:* The criterion for such definitions is chosen among the rates of growth given for various phenomena, such as population, urban land, and others.

● **Multiple definitions:** These are definitions using several criteria jointly.

Because megalopolises are still in the very early stages of their formation and we are not in a position to observe them in any fully "mature" form, and because studies about them are still very scanty and, for the most part, of a preliminary nature, it is still difficult to arrive at a satisfactory definition. The Athens Center of Ekistics has made certain first attempts in this direction which can be classified according to the above scheme. These have helped in obtaining a first approximate delineation of a number of megalopolises of the present and the near future, and in obtaining some rough comparative data about them.

Other, more sophisticated definitions may be developed as our knowledge about megalopolises increases. These may have to be used either independently or in combination with some of the definitions mentioned above.

Studies on megalopolises

The first systematic study of a modern megalopolis and the definition of the term megalopolis was made by Gottmann in his
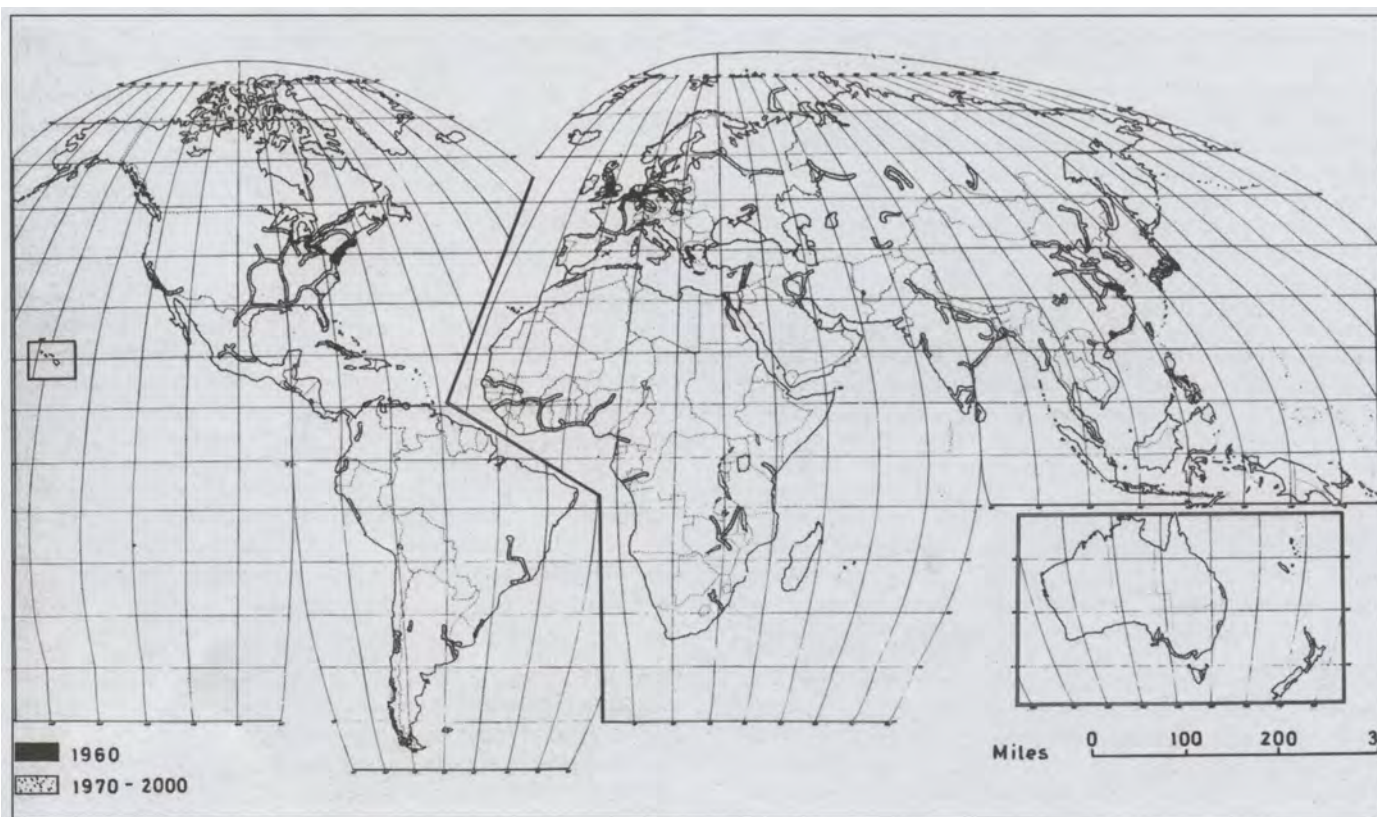
Fig. 1a: Megalopolises AD 1960 to 2000.

study of the East Coast megalopolis of the United States rang-ing from Boston to Washington.[1]

The Athens Center of Ekistics started working systematically in this field in 1960 when the first tentative studies about major settlements were made under the research project named the City of the Future Research Project. These studies were gradu-ally intensified and the whole project is beginning to comprise a greater number of examples of megalopolises in several parts of the world (in England, Central Europe, the United States, Greece, and, more recently, in Japan, South America, and so forth). Based on these partial studies and on some more gener-al considerations, tentative projections were made for the world as a whole for the year 2000 (fig. 1a).

In 1965 a more detailed study of the Great Lakes mega-lopolis in the United States was started, and carried out in suc-cessive "waves" of increasing extent and depth, within the frame of the Developing Urban Detroit Area Research Project, undertaken as a joint effort by the Detroit Edison Company, Wayne State University, and Doxiadis Associates.[2] This study is still proceeding.

Some historical remarks

It seems useful to situate the concept of megalopolis in histori-cal perspective, although it refers to a phenomenon emerging in the present and expected to evolve mainly in the future.

Permanent rural settlements may have appeared 12,000 to 15,000 years ago, and the first dated ones go almost as far back as 8000 B.C. The first urban settlements may have ap-peared already within the 7th millennium B.C. (Catal Huyuk, Jericho), but larger and better organized urban life and corre-sponding settlements are usually regarded as having emerged at the beginning of the 4th millennium B.C. in Mesopotamia. They grew quickly, so that about a millennium later the first me-tropolis (Ur) appeared, with a population of the order of 100 000. Another two millennia passed before settlements reached pop-ulations of almost 1 million (Babylon), and almost another passed before the 1 million mark was exceeded (Rome). During the Middle Ages the 1 million mark was approached for short periods in such places as Constantinople (6th to 9th centuries) and China (Hangchow and Peking); even Aztec Mexico may have approached 1 million, according to one estimate. One had to wait till about 1800 to see a first modern western city (London) exceed 1 million; thereafter the development of con-temporary metropolises, the three largest of which exceed 10 million (New York, Tokyo, London), is well known. These, how-ever, are rare and exceptional achievements in the history of human settlements. In the past the bulk of the earth's population resided in small rural settlements; the percentage of urban pop-ulation, from inconspicuous levels, rose abruptly to reach 45 percent in 1960 and 50 percent in 1966; it is expected to reach 60 percent in 1976 and just over 75 percent in A.D. 2000. The percentage of population living in cities with over 100 000 inhab-itants reached 23.7 percent in 1960, and it is anticipated that this will grow to 38.5 percent in 1975,59 percent in A.D. 2000, and 74 percent in A.D. 2030; the percentage living in cities with over 1 million inhabitants is expected to rise from 12.5 percent in 1960 to 21 percent in 1975, 38 percent in A.D. 2000, and 51 percent in A.D. 2030. It is in this picture of abruptly rising urban-ization that the megalopolis emerged, probably somewhere in the 1940's, in a first primitive form. Within a generation, it grew considerably to reach, for the first time now, appreciable propor-tions, although its character remains primitive in comparison with patterns expected for A.D. 2000.

In present times, the leap from the metropolis to the mega-lopolis has been spectacular. From being represented on a nor-mal map as mere points, settlements suddenly started appear-ing as large regions with very concrete dimensions and shape;

from diameters of some tens of kilometers at the most for the largest metropolises, they have now reached diameters of sev-eral hundred kilometers (and we are on the verge of exceeding 1,000 km) for the larger megalopolises; and from a maximum area of a few hundred square kilometers for the largest metrop-olises, we now leap to areas over 100,000 square kilometers with megalopolises, meaning a multiplication by almost 1000.

The anticipated very rapid growth until "the Era of the Megalopolis" has already been referred to. We may only men-tion that with a leap in population sizes from about 15 million (the present largest metropolises) to 60 to 70 million (the pres-ent largest megalopolises) new orders of population size are achieved, and sizes of the order of 200 to 300 million may be-come a reality around A.D. 2000, with 1 to 1.5 billion expected later in the twenty-first century. This increase in population alone suffices to suggest what novelty and complexity of struc-ture and function may accompany these new scales in urban settlements.

Identification of a great lakes megalopolis

General

It is anticipated that one of the more important megalopolitan formations will develop in the Great Lakes area of the United States. Quite apart from the City of the Future Research Proj-ect, and independently of each other, many authors and admin-istrative authorities seem to be taking into account the possibili-ty of the emergence of something like a Great Lakes megalopo-lis and a large proportion of the inhabitants of this area seem to feel that such a megalopolis is coming, if it has not already reached its early stages of development.

How far are we already entitled to speak of a Great Lakes megalopolis? There do not seem to be sufficiently detailed stud-ies to give an answer to this problem so far. Doxiadis Associates and the Athens Center of Ekistics felt that a preliminary study which would merely aim at posing this problem would be in place. It should of course be understood that much more thor-ough and detailed studies would be necessary before a final an-swer to this problem, either positive or negative, could be given.

As a first approach, the study was oriented toward defining and identifying the area within which this megalopolis was sus-pected to be emerging. Second, it attempted a comparison with the eastern megalopolis to determine whether the present sus-pected Great Lakes megalopolis could be compared with the eastern megalopolis at some earlier stage in its evolution, in which case it would be interesting to introduce the concept of a time lag between the two megalopolises for each variable con-sidered.

Method of analysis

One of the primary objectives was to define the area within which the Great Lakes megalopolis was supposed to be emerg-ing; the method followed was to make successive approxima-tions based on the study of various phenomena by counties.

Three major clusters were isolated as constituting the main elements of the Great Lakes megalopolis: one centered on Chicago and Milwaukee, another centered on Detroit, and a third one centered on Cleveland and Pittsburgh. Also con-sidered was the possibility of a northeastern extension into Canada as well as the connection with other adjacent urban clusters, such as one around Cincinnati in the south, or a branch extending south of Lakes Erie and Ontario, east through the Mohawk Valley, and forming a link between the Great Lakes megalopolis and the eastern megalopolis.

A correct study of the megalopolis concept should take into

account that inherent to the megalopolis is its growth through time, and its boundaries are constantly changing. This is well illustrated in Gottmann's *Megalopolis, The Urbanized Northeastern Seaboard of the United States* where two different areas, one for 1950 and another, larger one for 1960, are shown.[1] Consequently, if a Great Lakes megalopolis already exists it would have boundaries covering a larger area today than before, and would be expected to cover a still larger area as it grows in the future.

Since an examination of this growth in area would complicate matters considerably at the present stage, two constant areas have been defined for the purposes of comparison; in the eastern megalopolis (EM) it is the 1960 megalopolis after Gottmann which is usually taken into consideration; for the Great Lakes megalopolis (GLM) a preliminary definition, the result of the pres-

ent study, has been adopted (figs. 1b and 1c, and also figs. 4 and 5).

The phenomena considered in the definition of the Great Lakes megalopolis are the following:

- Total urban population (Great Lakes megalopolis 1840, 1850, 1870, 1960, eastern megalopolis 1790, 1810, 1830,1930)
- Total population of metropolitan areas (Great Lakes megalopolis 1960, eastern megalopolis 1930)
- Population densities, 1910, 1930, 1950, 1960
- Population changes by Standard Metropolitan Statistical Areas (SMSA) for 1940-1950, 1950-1960
- Population trends by counties 1940-1960
- Percent population change by counties 1950-1960
- Population size by SMSA's 1960
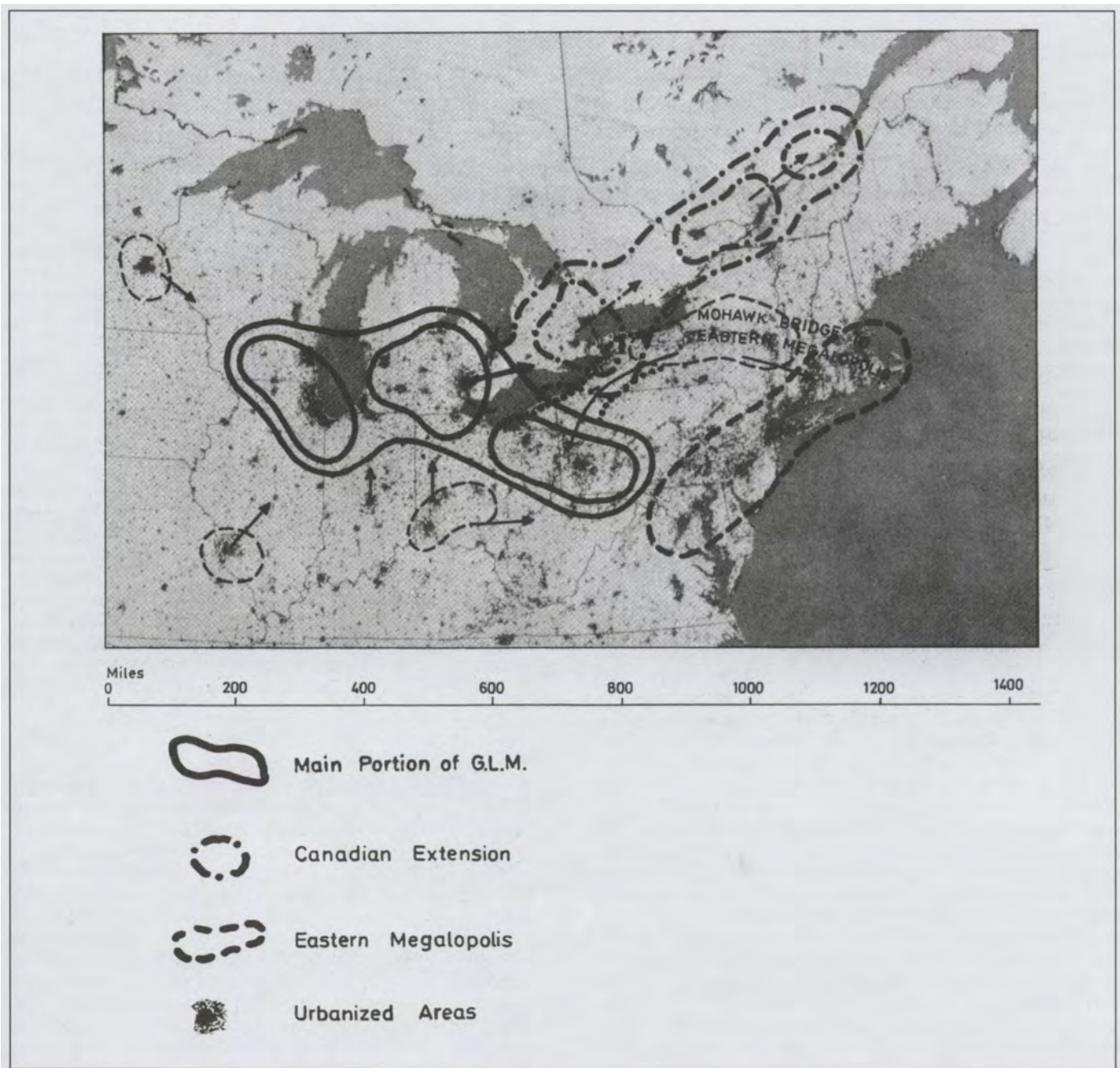
Fig. 1b: A preliminary definition of the Great Lakes megalopolis.

- Population size order by SMSA's and urban counties 1960
- Percentage of urban population by counties 1960
- Percentage of white population by SMSA's
- Median family incomes by SMSA's 1959
- Percentage of families earning more than $5,000 by counties 1949-1950
- Percentage of families earning more than $10,000 by counties 1960
- Aggregate income by SMSA's for 1960
- Percentage of employed population in manufacturing by SMSA's 1960
- Counties with metropolitan-type economies
- Value added by manufacturing in 1958 by SMSA's
- Change of commerce of U.S. ports

- Urbanized areas in 1960
- Median value of owner occupied houses by SMSA's 1960
- Major highway network 1964
- Rerouting of the rail traffic on the new "Penn Central" railway system.

The analysis of the above phenomena helped in understanding the character of the area within which the Great Lakes megalopolis is supposed to be emerging and further in assessing the relative degree of development of the Great Lakes and the eastern megalopolises. By comparing the results of overlapping between the maps representing the phenomena earlier enumerated, a first definition of the boundaries for the suspected megalopolis was arrived at, and a number of its characteristics could be analyzed and understood in a first approximation.
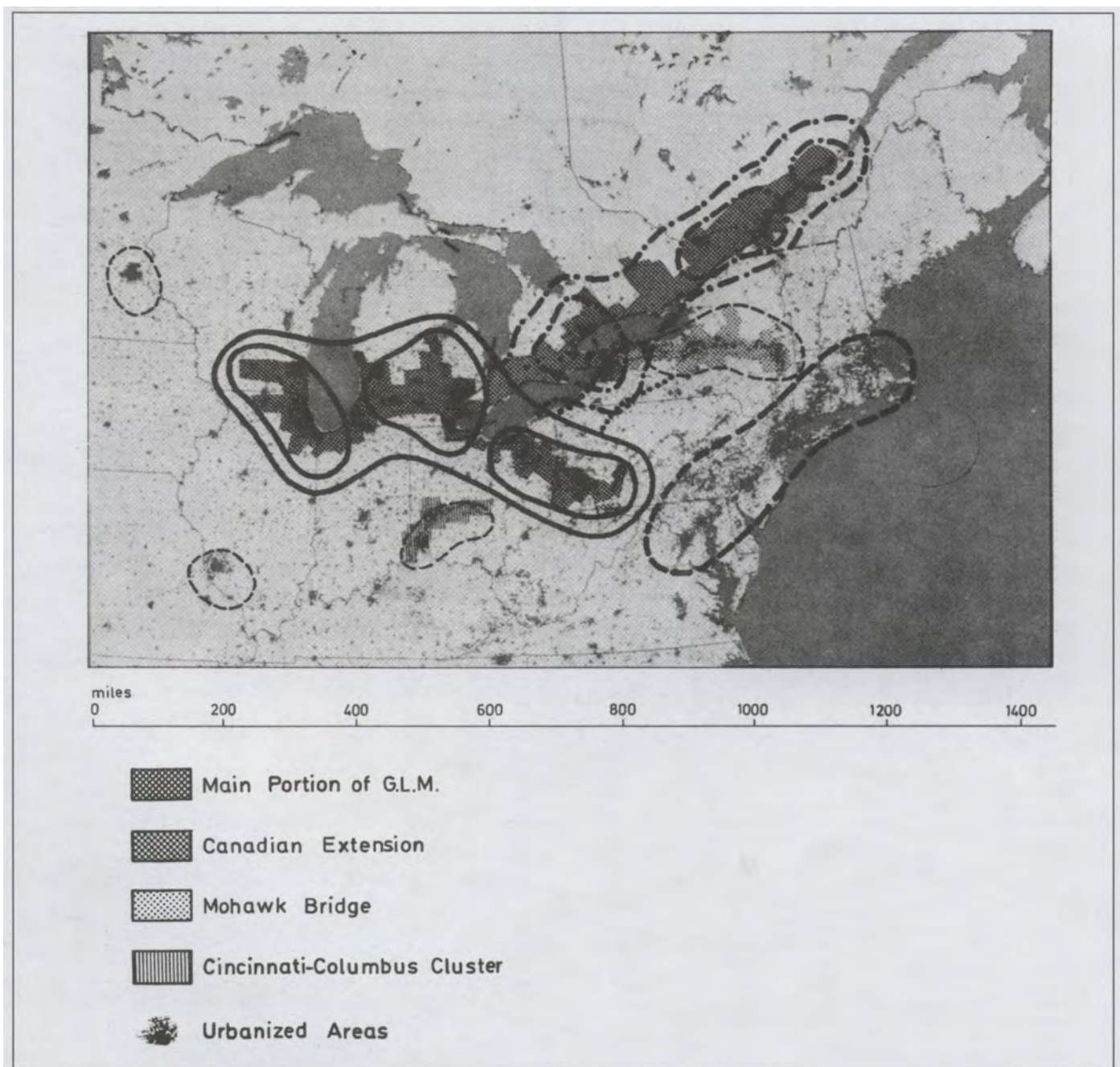
Fig. 1c: Tentative boundaries of the Great Lakes megalopolis and its probable extensions.

A comparative analysis of urbanized areas

Furthermore, in view of the wealth of statistical material available for "urbanized areas" in the United States, as defined by the U. S. Bureau of the Census, a tabulation of the more characteristic data by urbanized areas was compiled and is reproduced here. For comparison, table 1 shows data for 1960 for the seven most populated urbanized areas of the Great Lakes and eastern megalopolis regions.

The seven largest urbanized areas in the Canadian extension of the Great Lakes megalopolis are listed in table 2. For Canada we used the nearest equivalent-census metropolitan areas.

A study of figure 2 and tables 1 and 2 permits the following conclusions:

● **Land Area:** The eastern megalopolis is 7.3 percent larger primarily due to the very large area of the New York-northeastern New Jersey urbanized area.

Table 1
Comparison of Great Lakes and eastern urbanized areas by selected characteristics

URBANIZED AREAS*	Area	Population, 1960						Family income, 1959			Other selected socioeconomic characteristics					Housing units, 1960		Occupied housing units			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	Land Area (Sq. Miles)	U. S. Rank	Total (1,000)	Per Sq. Mile	% Increase, 1950-1960	% Nonwhite	Median Age Years	Median Income ($)	% Under $3,000	% $10,000 And Over	Aggregate Income In 1959 Of Population, 1960 ($ Million)	Median School Years Completed 25 Years Old And Over, 1960	% Unemployment Of Civilian Labor Force, 1960	% Of Total Employment In Mfg., 1960	% Of Total Mfg. Employment In Durable Goods Industries, 1960	% In One Unit Structures	% In Structures Built In 1950 Or Later	% With Air Conditioning	% With Automobile	Median Value Of Owner Occupied Units ($)	Median Gross Rent, Of Renter Occupied Units ($ Monthly)
GREAT LAKES																					
Chicago-Northwestern Indiana	959.8	3	5,959	6,209	21.1	16.1	31.3	7,292	10.7	25.7	14,572	10.8	4.4	35.2	63.7	43.1	22.1	14.7	70.4	18,600	89
Detroit	731.9	5	3,538	4,834	28.6	15.8	29.6	6,838	13.6	22.0	7,621	10.8	7.9	40.7	82.4	74.3	28.9	6.8	82.1	13,300	79
Pittsburgh	525.0	9	1,804	3,437	17.7	8.1	32.4	6,106	13.8	17.1	3,667	10.8	6.8	35.9	80.6	71.7	20.5	6.8	74.1	12,900	69
Cleveland	586.7	10	1,785	3,042	29.0	14.7	31.4	6,967	11.4	22.4	4,154	11.1	5.3	39.4	72.8	62.6	25.2	8.9	79.8	17,700	84
Milwaukee	392.0	14	1,150	2,934	38.6	5.8	30.1	7,036	9.4	21.0	2,636	11.2	3.9	40.8	73.1	54.7	28.4	7.8	77.9	16,500	89
Buffalo	160.2	16	1,054	6,582	17.7	8.1	31.2	6,394	12.6	16.8	2,148	10.4	6.9	38.4	64.0	49.3	20.6	5.1	76.3	14,800	74
Cincinnati	242.3	17	994	4,101	22.2	13.0	30.5	6,317	15.1	18.4	2,108	10.3	4.7	32.9	56.3	54.0	21.0	10.0	72.6	15,500	68
Total/Average	3,597.9		16,284	4,526	24.0	13.6	30.9	6,889†	12.0	22.2	36,906	10.6	5.7	37.3	69.8	56.8	24.0	10.1	75.3	16,000	83
EAST COAST																					
New York-Northeastern New Jersey	1,891.5	1	14,115	7,462	14.8	11.3	33.9	6,675	12.4	22.7	34,139	10.6	4.7	29.2	43.1	31.8	19.5	15.0	58.6	17,800	76
Philadelphia	596.7	4	3,635	6,092	24.4	17.5	32.0	6,437	13.2	19.2	7,632	10.4	5.2	35.0	49.1	79.5	21.8	18.9	68.7	10,700	69
Boston	515.8	7	2,413	4,679	8.0	3.5	32.3	6,622	11.3	20.6	5,365	12.1	3.8	28.8	52.9	43.9	14.0	5.8	71.7	15,800	82
Washington	340.7	8	1,808	5,308	40.5	25.9	29.4	7,603	10.3	30.7	4,615	12.3	2.9	7.6	36.7	56.5	35.6	25.7	73.5	17,100	88
Baltimore	220.3	12	1,419	6,441	22.1	24.4	30.1	6,319	14.3	17.2	2,805	9.5	5.6	31.5	63.0	75.9	26.0	12.5	69.0	10,500	77
Providence-Pawtucket R.I.-Mass.	188.0	26	660	3,508	13.1	2.2	33.2	5.688	15.7	12.4	1,229	10.1	5.1	40.9	60.2	49.0	16.5	4.8	78.6	12,300	62
Norfolk-Portsmouth, Va.	108.6	36	508	4,676	31.9	26.5	24.7	5,075	27.1	11.1	835	10.6	5.1	16.2	64.6	72.2	35.6	14.1	73.5	11,000	72
Total/Average	3,861.6		24,558	6,360	17.7	13.4	32.7	6,624†	12.6	21.7	56,620	10.5	4.6	26.5	50.7	45.1	21.0	14.9	65.1	15,200	76

Source: U. S. Dept. of Commerce, Bureau of the Census, *County and City Data Book, 1962.*
* Only the seven largest U.S. urbanized areas of each included.
† Average family incomes ($): Great Lakes 8,887; East Coast 8,959. Per capita income ($): Great Lakes 2,266; East Coast 2,306.

Table 2
Comparison of Canadian metropolitan areas by selected characteristics

Census metropolitan areas*	Population, 1961			Family income, 1961			Occupied dwellings, 1961		Manufacturing employment, 1961
	Canadian rank	Total (1,000)	Percent increase 1951–61	Average income ($)	Percent under $3,000	Percent $10,000 and over	Percent single detached	Percent with automobile	Percent labor force in manufacturing
Montreal	1	.2,110	43.3	6,046	17.2	10.9	19.5	54.1	32.4
Toronto	2	1,824	50.7	6,542	14.1	12.1	55.7	72.9	32.3
Ottawa	5	430	46.9	6,643	12.6	13.0	48.3	72.9	13.2
Hamilton	6	395	41.0	6,030	14.7	8.5	73.0	77.0	46.3
Quebec	7	358	29.4	5,801	19.2	10.2	29.2	55.2	20.7
Windsor	10	193	18.2	5,384	20.6	6.7	75.2	73.6	43.1
London	12	181	40.6	5,985	14.4	8.5	66.9	76.3	27.7
Total/Average		5,491	43.6	6,189	15.7	11.0	42.1	65.1	31.4

Source: Census of Canada, 1961.
* Based on areas defined for the 1961 Census; only the seven largest areas in the Great Lakes vicinity included.
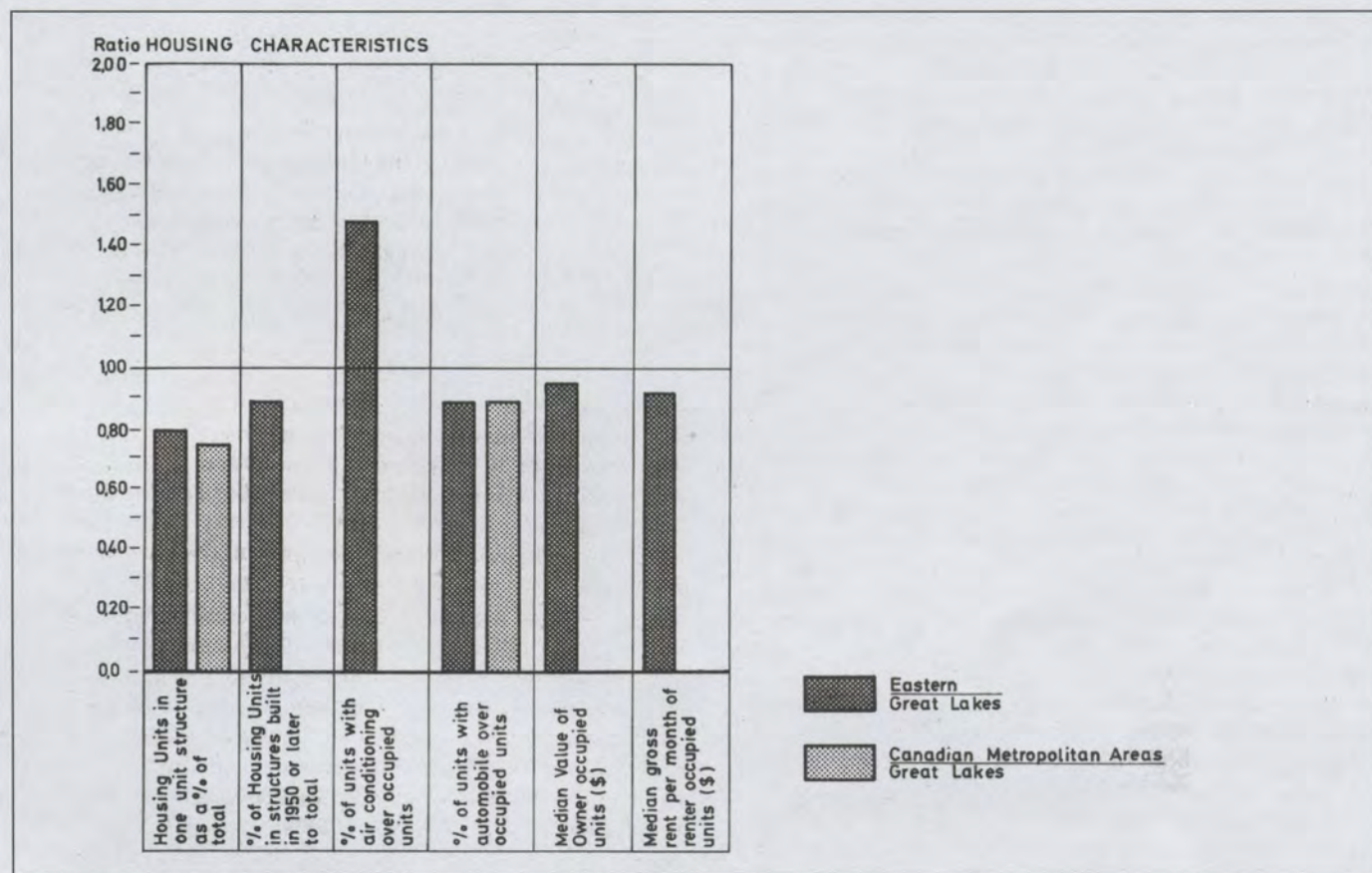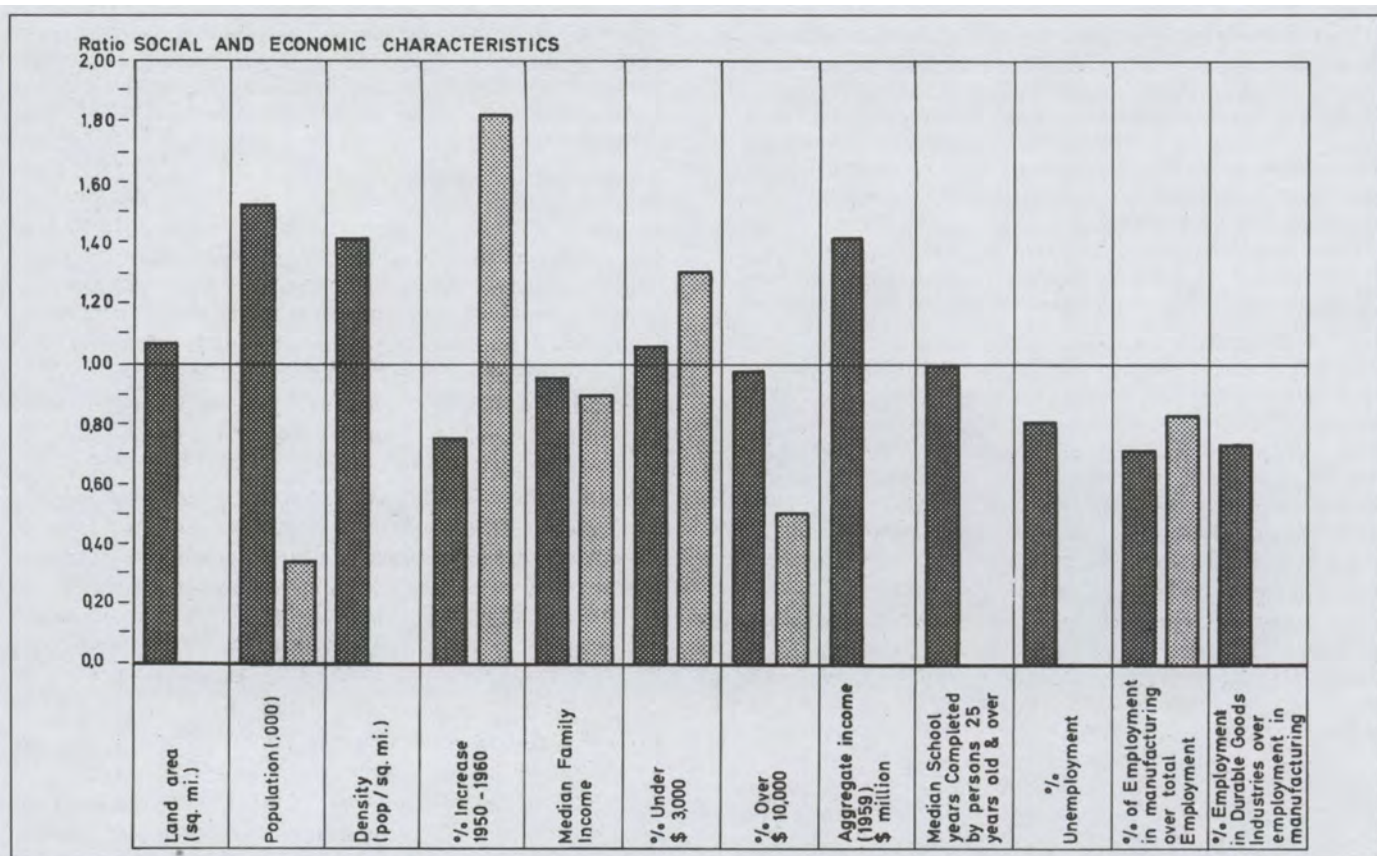
Fig. 2: Comparison of selected social, ecological and housing chracteristics among major urbanized areas.

• **Total Population:** The eastern megalopolis is considerably more populous, having 24.9 million inhabitants compared to 16.3 million in the Great Lakes megalopolis, which in turn has three times the population of its Canadian extension. The distribution of population among urbanized areas is much more uneven in the eastern megalopolis; here New York surpasses the rest and the second largest city, Philadelphia, is one-third its size. Within the Great Lakes megalopolis, Detroit is only 40 percent smaller than Chicago. Within the Canadian extension Montreal is only 17 percent larger than Toronto but inequalities between these cities and the remaining census metropolitan areas are very great.

• **Population Density:** Densities are higher in the eastern megalopolis, exceeding those of the Great Lakes by about 40 percent (6,360 inhabitants per square mile as compared with 4,526, respectively). Density differs among the various urbanized areas, especially in the Great Lakes megalopolis where it differs considerably. Buffalo, with the highest density in the Great Lakes megalopolis, comes second to New York, which has the highest density of all.

• **Population Growth 1950-1960:** A considerably more rapid overall population increase is noticed in the Great Lakes megalopolis, 24.0 percent versus 17.7 percent for the eastern megalopolis. More uniform figures are found in the Great Lakes megalopolis, whereas the spread in the eastern megalopolis is larger. The largest figure, 40.5 percent, is found in Washington; the lowest, 8.0 percent, in Boston – both in the eastern megalopolis. In the Great Lakes megalopolis the highest percentage increase, that for Milwaukee, is only slightly lower than that for Washington; the next highest, those for Cleveland and Detroit, are higher than all eastern megalopolis rates of growth except those for Washington and Norfolk. Since Milwaukee can be regarded as a fringe area of the Chicago complex, this means that Cleveland and Detroit are the fastest growing urbanized areas of the Great Lakes megalopolis. It may be characteristic that the two *urbanized* areas with the lowest increase, Pittsburgh and Buffalo, show a percentage of increase exactly equal to the average for the eastern megalopolis. In other words, the lowest percentages of increase in the Great Lakes megalopolis (Buffalo and Pittsburgh) are higher than those of New York, Providence, and Boston, or the entire northern section of the eastern megalopolis.

Canadian increases surpass even those of the Great Lakes megalopolis. The highest (50.7 percent) is in Toronto, a fact of particular importance for the future development of the Canadian extension. Only Windsor, across the river from Detroit, displays a relatively low rate of growth in population.

• **Median family income:** This is approximately on the same level in both megalopolitan areas, being only slightly higher in the Great Lakes. Average family and per capita incomes, however, are higher on the east coast. The distribution among the various urbanized areas of the eastern megalopolis has a greater spread of values than occurs in the Great Lakes megalopolis. Milwaukee and Detroit, with the second and third highest median family incomes after Chicago, surpass all urbanized areas of the east coast except Washington.

In the Canadian extension, average family incomes are lower but evenly distributed among census metropolitan areas, as in the Great Lakes megalopolis.

• **Aggregate income:** Taking into consideration that family or per capita incomes are roughly on the same level although population is considerably higher in the eastern megalopolis, it follows that aggregate income is considerably higher there – by about 55 percent. New York has almost as much aggregate income as all seven urbanized areas of the Great Lakes.

• **Median school years:** Median exposure to education is at about the same level in both areas. There are no important differences among the various urbanized areas, except that Baltimore is considerably lower and Boston and Washington considerably higher than the eastern megalopolis average.

• **Employment structure and unemployment:** In 1960, unemployment in the Great Lakes was more than 20 percent higher, with the highest percentage in Detroit, followed by Buffalo and Pittsburgh. All exceeded Baltimore, which has the highest rate for the eastern megalopolis. This may be related to the considerably higher percentage of manufacturing employment, particularly in durable goods, which is found in the Great Lakes area. Such activities are more vulnerable to recession and other structural changes such as automation.

However, the correlation is less apparent when individual urbanized areas are examined because of special factors influencing each case.

Employment in manufacturing is considerably higher in the Great Lakes megalopolis (37.3 percent) than in the eastern megalopolis (26.5 percent). Of this, 69.3 percent in the Great Lakes and 50.7 percent on the East Coast is in durable goods. Detroit has the highest percentage of manufacturing employment in durable goods (82.4 percent) while Washington has only 7.6 percent of total employment in manufacturing.

Canadian figures, which refer only to percentage of employment in manufacturing (31.4 percent) fall between those for the Great Lakes and the East Coast. The highest percentages are in Hamilton and Windsor, near Detroit.

• **Housing Units:** In view of population changes during recent decades, it is only natural that the percentage of new houses is higher in the Great Lakes than in the eastern megalopolis. Differences between urbanized areas are not marked in the Great Lakes, where Detroit and Milwaukee head the list, but are pronounced on the East Coast, where Boston has only 14 percent of new houses compared to 35.6 percent for Washington. There is a close relationship between age of housing and rates of population increase.

The percentage of single-unit detached houses, an index of the suburban type of urban development, is considerably higher in the Great Lakes megalopolis than in the East (56.8 percent and 45.1 percent, respectively), and lowest (42.1 percent) in the Canadian extension. Nevertheless, the urbanized areas with highest percentages of single-unit detached houses are found in the eastern megalopolis (Philadelphia 79.5 percent, Baltimore 75.9 percent). Detroit is the highest (74.3 percent) in the Great Lakes. The Canadian census metropolitan areas display great divergences, ranging from 19.5 percent (Montreal) to 75.2 percent (Windsor).

• **Occupied units with air conditioning:** The percentage of occupied housing units with air conditioning is appreciably higher in the East (14.9 percent compared to 10.1 percent for the Great Lakes). Within each megalopolis, the percentage for each urbanized area appears to be directly dependent on climatic conditions and income distribution. Divergencies within the eastern megalopolis are greater than on the Great Lakes.

• **Occupied units with automobile:** The Great Lakes account for a higher percentage of occupied units with automobile than the eastern megalopolis (75.3 percent compared to 65.1 percent), Detroit being first with 82.0 percent, the highest in the United States. The highest percentage on the East Coast is in Providence. Although the location of the automobile industry seems to have affected these percentages in the various urbanized areas, especially in the Great Lakes megalopolis, other differences may be due to variables such as the existence of rapid transit systems and the suburban character of each.

The Canadian extension of the Great Lakes megalopolis has

the same percentage as the eastern megalopolis (65.1 percent), but metropolitan areas nearer the Great Lakes display percentages very close to the Great Lakes average.

● **Value and rents of housing units:** In both of these variables the Great Lakes megalopolis exceeds the East Coast by a small margin. As far as the distribution among the various urbanized areas is concerned, there appears to be a fair amount of correlation between the two variables. However, there are important exceptions probably due to the supply and demand situation or other special factors. Overall, there is a greater spread in the eastern megalopolis than in the Great Lakes.

● **Change in population densities 1950-1960:** As figure 3 shows, densities within the two megalopolitan areas are falling, a phenomenon which has been ascertained in a number of other studies. The decrease in population densities is considerably faster in the eastern megalopolis," which has the highest overall density. Apparently an equalization process is taking place.

The above-mentioned comparisons of urbanized areas within the Great Lakes megalopolis and the eastern megalopolis support the view that the Great Lakes megalopolis is in a less "advanced" state of development than the eastern megalopolis, but is growing more rapidly in a way likely to considerably reduce the gap between them in the near future.

Preliminary definition

A comparison of the various phenomena considered shows the formation of certain clusters within the Great Lakes megalopolis, with three major clusters centered around Chicago-Milwaukee, Detroit, and Cleveland-Pittsburgh. These three major clusters are considered as forming the main portion of the Great Lakes megalopolis.

Those phenomena for which we have data for Canada consistently show a Canadian extension of the main portion of the Great Lakes megalopolis north of the Great Lakes, via London (Ontario), toward the Toronto, Montreal-Ottawa, and Quebec clusters.

A number of clusters to the south, southwest, and west of the Great Lakes megalopolis appear more or less frequently on a number of maps representing the phenomena considered; of these, the Cincinnati-Dayton-Columbus cluster appears more consistently and more prominently. It has been shown as a cluster related to the Great Lakes megalopolis, although it is not possible to predict whether this cluster, which is growing faster than the three clusters within the main portion of the Great Lakes megalopolis, will be directly connected.

The Mohawk "bridge" appears prominently on a number of maps. In view of the expected rapid development of both the eastern megalopolis and the Great Lakes megalopolis, at least one bridge connecting these two areas is likely to develop: a connection south of Lake Erie from Cleveland to Buffalo, Albany, Massachusetts, and Connecticut. This link will probably be strengthened by the increasing importance of the Canadian extension of the Great Lakes megalopolis, especially in the rapidly growing Toronto-Hamilton-Buffalo cluster. The Buffalo-Albany arc, therefore, will offer two different connections westward, one toward Toronto into Canada north of the lakes and another one south of the lakes toward Cleveland and the main portion of the Great Lakes megalopolis (fig. 4).

The exact delimitations of the areas to be included in the Great Lakes megalopolis and its extensions cannot be determined at this point. Many more detailed studies will be needed before such a precise delimitation could be reached. Still, to permit statistical comparisons, a provisional delimitation has been attempted (fig. 5).
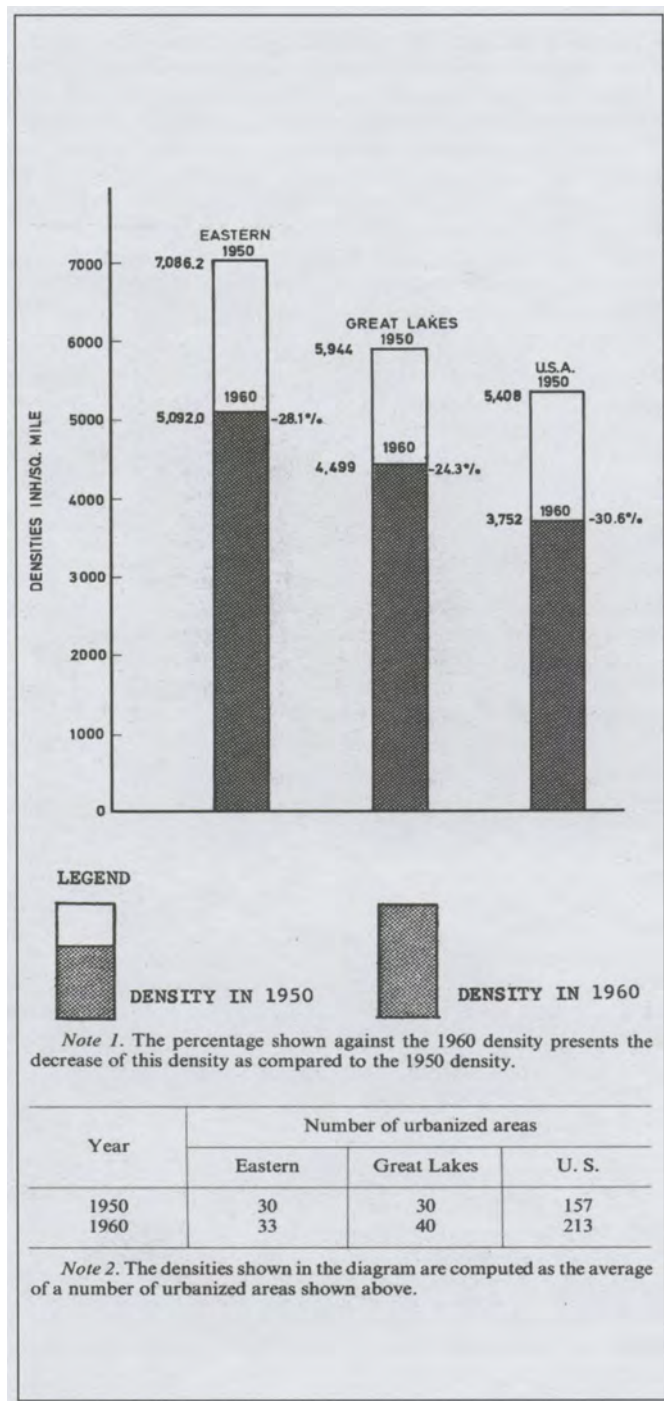
Fig. 3: Change in densities of urbanized areas 1950 to 1960.

Comparative analysis of growth patterns

The relative growth during the last 50 years of the main clusters that form the Great Lakes and eastern megalopolises is shown in table 3.

The Great Lakes megalopolis has grown at a much more rapid pace (2.15 percent) than the eastern megalopolis for which the average yearly growth rate is 1.52 percent; in other words, the population of the Great Lakes megalopolis has trebled in half a century while that of the eastern megalopolis has slightly more than doubled.
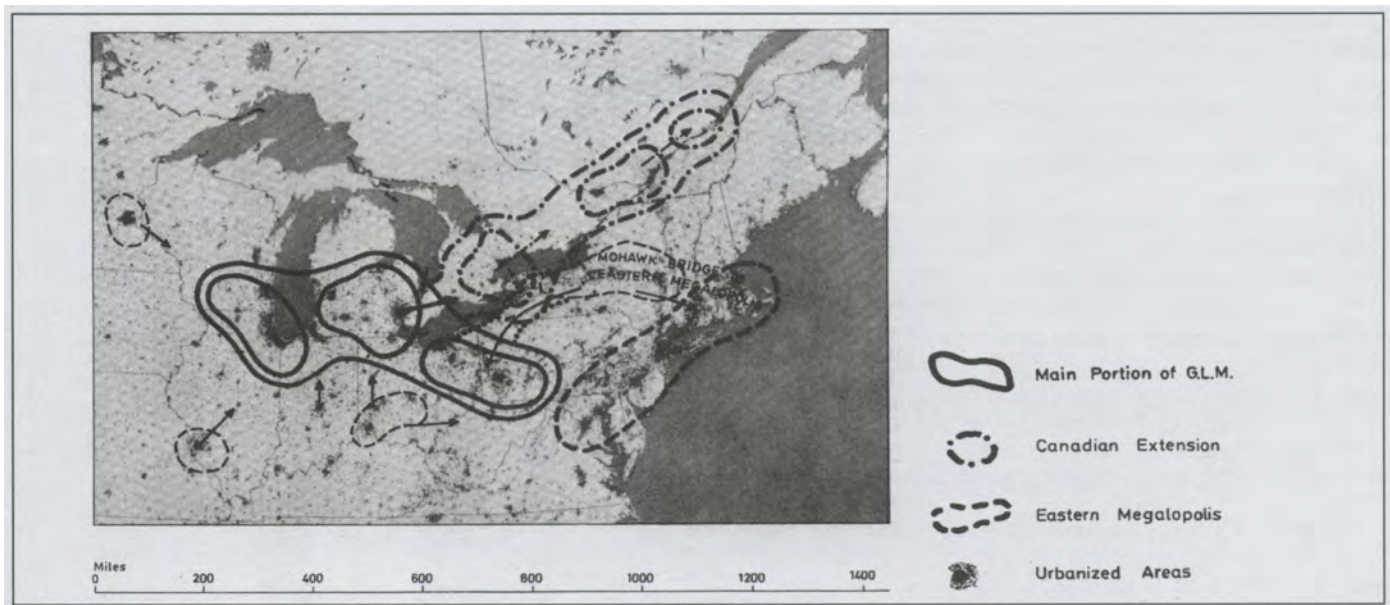
Fig. 4: A preliminary definition of the Great Lakes megalopolis.
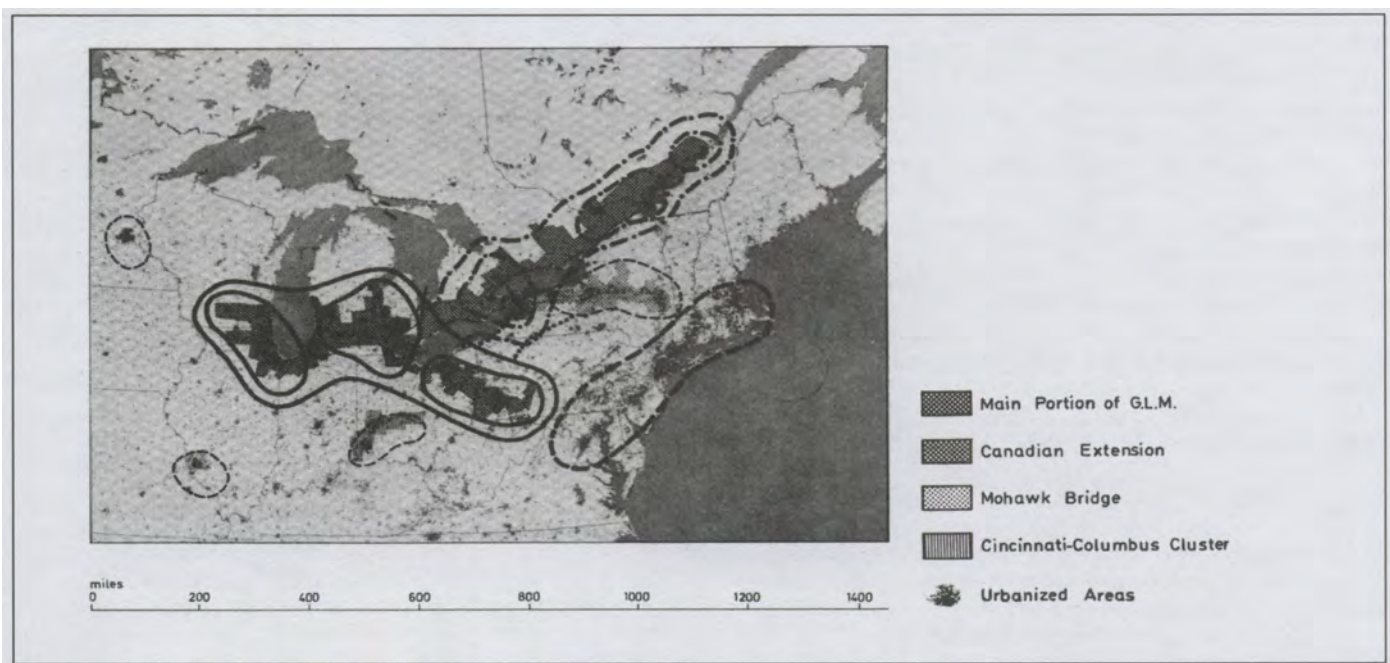
Fig. 5: Tentative boundaries of the Great Lakes megalopolis and its probable extensions.

Table 3
Comparison of populaton growth between the Great Lakes and Eastern Megalopolises, 1910-1960

	1910	1920	1930	1940	1950	1960
Chicago area	3,463	4,494	6,053	6,293	7,254	8,903
Detroit area	1,304	2,263	3,674	3,973	4,983	6,232
Cleveland–Pittsburgh area	2,737	3,710	5,073	5,211	5,722	6,558
Great Lakes	7,504	10,467	14,800	15,477	17,959	21,693
Boston area	3,106	3,561	4,047	4,316	4,679	5,064
New York area	7,701	9,375	11,947	12,991	14,488	16,725
Washington–Philadelphia area	4,378	5,266	6,528	7,132	8,594	10,493
East Coast	15,185	18,202	22,522	24,439	27,761	32,282

Source: U.S. Department of Commerce, Bureau of the Census.
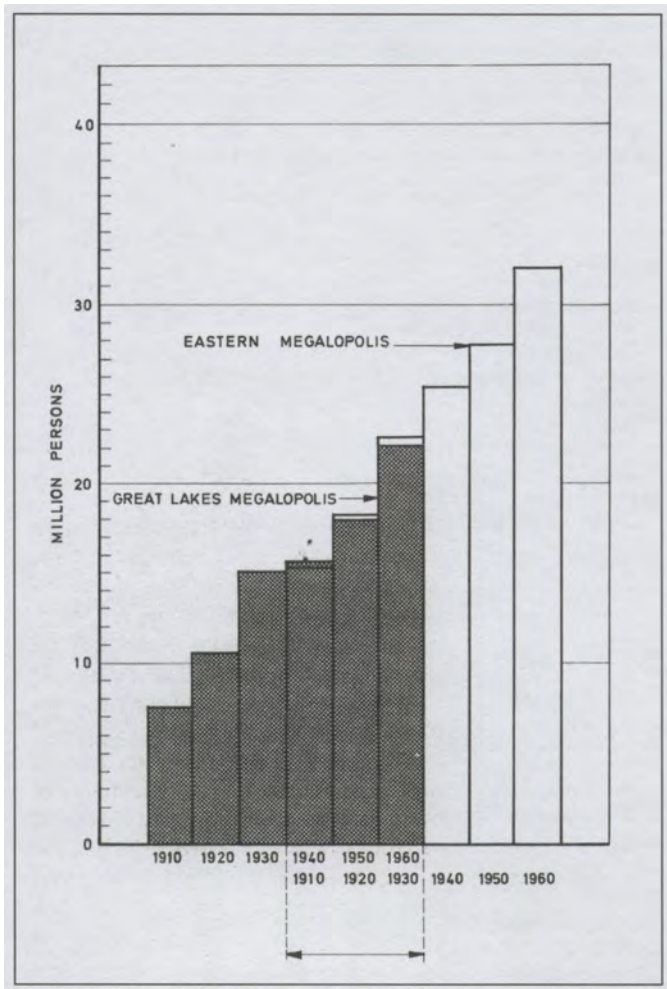
Fig. 6: Thirty-year time lag.

These statistics (fig. 6) also shows the similarity of figures for the Great Lakes megalopolis and eastern megalopolis taking into consideration the 30-year time lag which the analysis has shown (fig. 7). The time lag hypothesis, therefore, is positively confirmed by these as far as the variable "population" is concerned.

If growth rates are studied in more detail, it will be seen that the Great Lakes megalopolis has grown faster than the eastern one in every decade except 1930-1940, the depression decade. Among its three main clusters the one with the highest increase during the two last decades is that around Detroit. In the eastern megalopolis the corresponding position is occupied by the Washington-Philadelphia cluster in 1940-1950 and the New York cluster in 1950-1960.

The analysis has also shown that the time lag between comparable phenomena for the two areas has been considerably greater in the remote past. Initially it must have been greater than 50 years, then it progressively decreased to its present lag of about 30 years for most variables. In general, the Great Lakes megalopolis constitutes a younger version of the eastern megalopolis which, however, is growing more quickly than the eastern megalopolis.

The younger age of the Great Lakes megalopolis can be seen in the comparatively long distances separating its three main clusters. The more advanced eastern megalopolis consists of much closer clusters, so that the distances between them either disappear for certain variables or, for others, are quite small. As the Great Lakes megalopolis grows, its clusters will spread outward from their nuclei and their links will join as in the case of the eastern megalopolis.

This decrease of the time lag in the future is also anticipated by other studies, including the projections for the main regions of the United States made by the U. S. Bureau of the Census and various authors. According to them, the population of the Great Lakes area is expected to catch up with the mid-Atlantic region (covering the eastern megalopolis) by the end of this century or earlier.
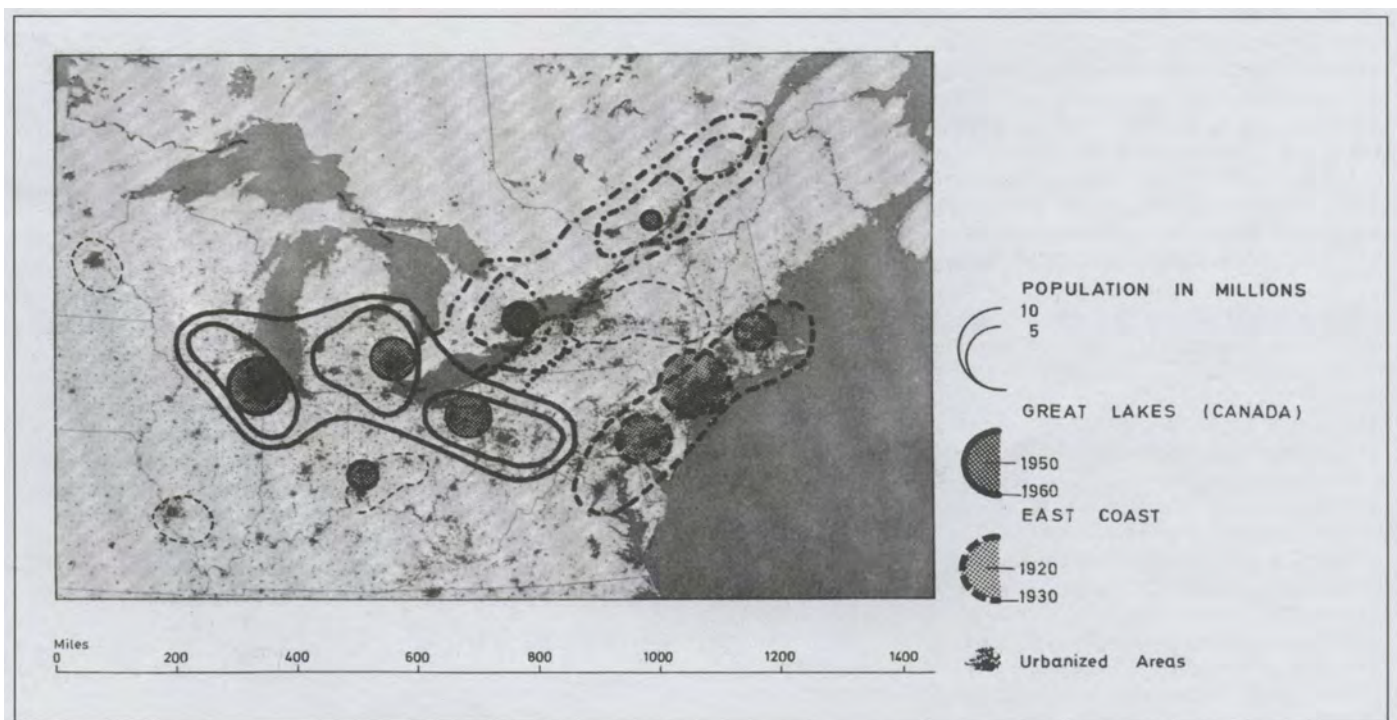
Fig. 7: Population by major metropolitan clusters: Great Lakes 1950-1960; Canadian 1941-1961; Eastern 1920-1930.

Towards a final definition of the Great Lakes Megalopolis

● **Methodology used:** Following the preliminary definition of the boundaries of the Great Lakes megalopolis referred to above, work is continuing to establish a final definition of the Great Lakes megalopolis at its present stage of development.

The method that was judged most appropriate for this purpose was the formal statistical technique known as Principal Component Analysis, a powerful statistical tool suitable for multivariate situations, that is, for cases where a large number of characteristics (i.e., variables) describe the units of an aggregate. The main advantage of this method consists in reducing the number of variables available to a limited number of components (or basic factors) capable of replacing all variables considered in describing the total phenomenon.

Each of these components contains, so to speak, that part of each variable which is common to all variables; conversely seen, this common part is due to the existence of the component. Moreover, each component accounts for a different part of each variable and has the important property of being orthogonal to, i.e., completely independent from, the others.

Each component is a linear function of all variables considered, each variable entering the equation with a different coefficient; the coefficients, different for each component, are also estimated by the analysis and can be viewed as weights assigned to the original variables to produce the components.

The extraction of the components is done so that the first component extracted accounts for the largest possible amount of total variation contained in the original variables, the second component accounts for the second largest amount of total variation, and so on in descending order so that in practice in most applications a few components are extracted, say 3, 4, or 6, and retained if together they account for a large part of total variation, say 60 percent, 70 percent, or more, while a good many others are ignored since each of the remainder accounts for only a negligible proportion of the total variation. In this way, from the mass of data contained in as many variables as 30 or 50 or even more, we end up with a manageable small number of basic components which adequately represent the whole body of original data.

Once the basic components are extracted, one is faced with the difficulty of interpreting them, since they do not have a concrete meaning as they stand. As a guide for their interpretation one uses the association that exists between each component and every single original variable. Those variables which show a strong correlation with the component considered give an indication as to its nature and enable one to describe its sociological, economic, social, demographic, physical, or other meaning.

● **Experimental application of principal Component Analysis:** For purposes of testing both the computer program and the whole process of Component Analysis, an experimental application was carried out with a limited number of variables. The area of this application consisted of the main portion of the Great Lakes megalopolis (as tentatively defined in figure 8) and a peripheral zone around it. The units that were judged convenient from the point of view of both scale and data availability were the counties; their number in this area totalled 246.

Twenty-eight variables were selected from the 1960 population census publications covering many aspects of the life and activities of a populated region. These variables were grouped into broader categories as follows (table 4):

The values of the 28 variables for each of the 246 counties were gathered and punched on cards, for computer processing. The analysis yielded seven components, which accounted for a total of 82 percent of the total variance contained in the original 28

variables. The first three components accounted for two-thirds of the total variance as follows (table 5):

Table 4
Variables grouped into broader categories

Category	Number of variables
Population size and structure	8
Population change	4
Socioeconomic level of population	4
Housing conditions	4
Employment characteristics	3
Education	2
Land	3

Table 5
Cumulative percent explained by component of variance

Component	Percent of variance explained by component	Cumulative percent of variance
I	39.6	39.6
II	17.1	56.7
III	9.6	66.3

Through examination of the variables with which every component was more strongly correlated, it was possible to identify the nature of the components and attach a particular meaning to them.

Thus, Component I was strongly correlated with variables indicative of size, with indices of economic level, and with urban structure characteristics; it was, therefore, tentatively identified as an *index of urban concentration.*

Component II was mostly associated with population age and change, with unemployment, with availability of land, and with percent of persons employed outside their county of residence; it seemed to be, in fact, an *index of suburban development.*

Component III was related to farmland and changes thereof. It seemed, therefore, that it reflected agricultural activities of the counties and could, therefore, be identified as an *index of agricultural character.*

Further study of the results of this experimental application of Component Analysis is continuing, and component values computed for each county on the basis of the values for the 28 original variables are being used for cartographic work.

In addition, investigation is being carried out for the use of a technique such as cluster or similarity analysis which would result in a classification of counties into homogeneous groups with respect to the three components.

Simultaneously, the design of the final application of Component Analysis is proceeding. This involves a much greater region and a much larger number of original variables ; it is expected that, among other things, the results of this application will enable us to arrive at a much more reliable definition of the Great Lakes megalopolis.

Tentative population projections for the year 2000

General

The first approach to the problem of the Great Lakes megalopolis produced some material which has been used as a basis for

a first series of entirely tentative population projections to A.D. 2000.

The area covered by these projections was first the main portion of the Great Lakes megalopolis and then its possible extensions (figs. 4 and 5). For reasons of comparison, similar projections were shown for the eastern megalopolis.

Furthermore, projections started with the above areas but also involved possible extensions, beyond the area of the megalopolitan formations (figs. 4 and 5), extensions which are expected to come about by the year 2000.

It should be stressed that these projections are of an entirely preliminary and tentative character. Several other methods of arriving at plausible population projections for A.D. 2000 (and also for the still more remote future) can be devised; still, the method delineated here is regarded as a first attempt to give orders of magnitude for the urban population in this area in A.D. 2000.

Methodology

The method used for arriving at population projections for the year 2000 started from projections for the initial central areas. These areas have been designated A for the main portion of the Great Lakes megalopolis, B for its Canadian extension, C for the Mohawk bridge, and D for the Cincinnati-Columbus cluster, and are here referred to as Case 1) (fig. 8). Following this, three types of successive extensions in the areas concerned were considered and corresponding population projections for these extensions were calculated and added to those of the initial "central" areas.

● **Population projections for the initial central areas:** Two main findings of the analysis have been used as starting points for the population projections for the initial central areas. These are as follows:
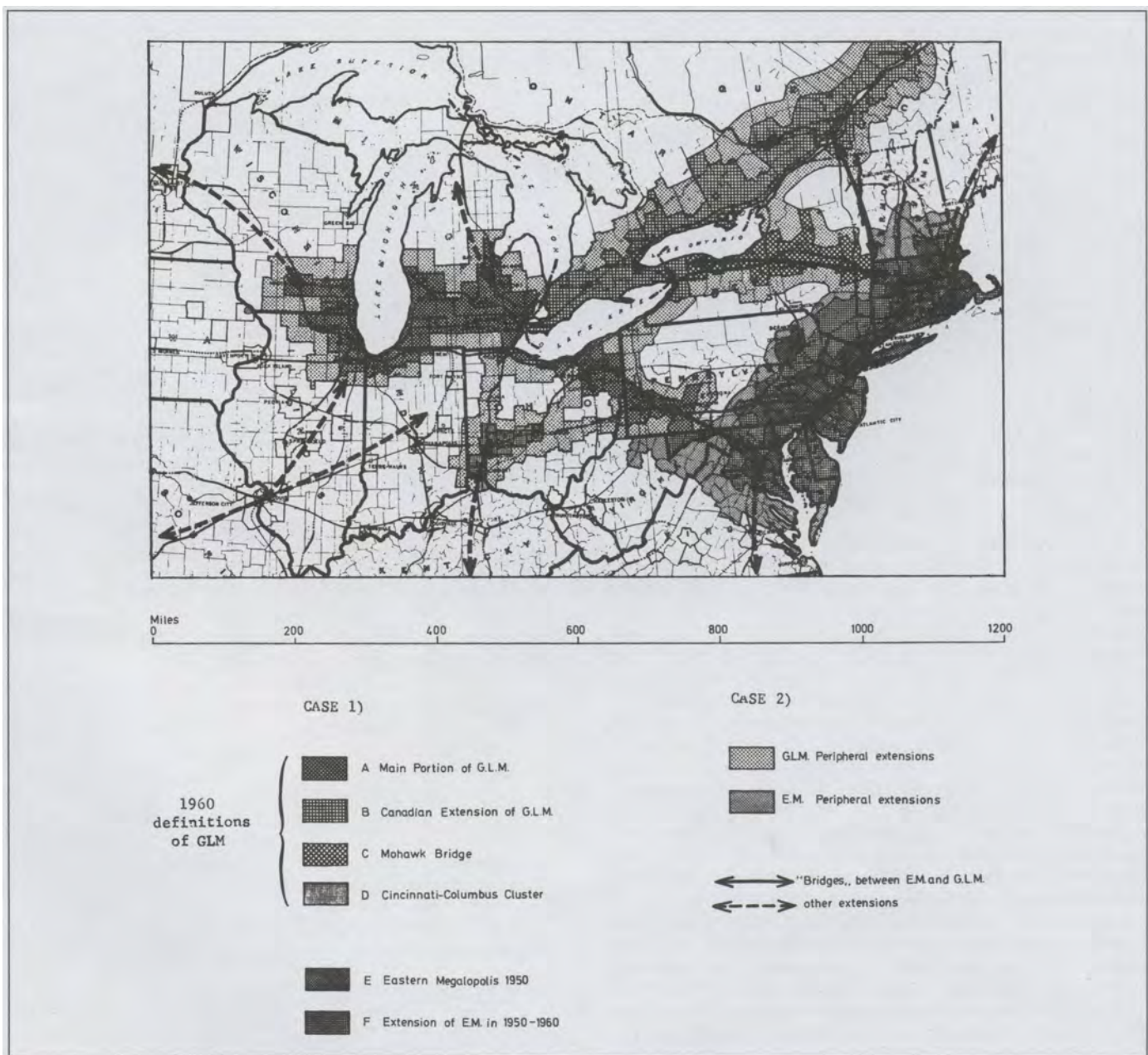
Fig. 8: Great Lakes and eastern megalopolises: 1960 definitions (Case 1) and peripheral extensions by the year 2000 (Case 2).

• A time lag of the order of 30 years seems to prevail for certain variables between the eastern megalopolis and the Great Lakes megalopolis. One should remember that these are mainly population variables (which are of interest precisely for the projections of the present report), whereas for other categories of variables the time lag is considerably shorter, if not nil or even negative. Therefore, dealing exclusively with population projections, the 30-year time lag has been taken as a basis for the years 1930 and 1960, respectively, for the eastern megalopolis and the Great Lakes megalopolis.

• In general, megalopolitan formations (or other highly urbanized formations showing certain megalopolitan characteristics) tend to show higher growth rates during their earlier phases of development whereas these growth rates tend to decrease as they approach later development stages. In this way, for example, the older eastern megalopolis grew in population at an average annual rate of 1.54 percent during 1950-1960, whereas the younger Great Lakes megalopolis grew by 2.09 percent annually during the same period; although not entirely comparable figures are available for the Canadian extension of the Great Lakes megalopolis (portion B), it seems that this still younger urbanized area is growing at a still faster rate, of the order of 2.6 or 2.7 percent annually.

On the basis of these considerations, the time lag between the eastern megalopolis and the Great Lakes megalopolis has been projected into the future, taking into account that this time lag was of the order of 50 years at the beginning of the nineteenth century; then decreased to approximately 40 years around the middle of the nineteenth century; and then further decreased, although at a slower rate, to reach the 30-year time lag for the years 1930-1960. If this concave decreasing curve is projected towards the year 2000 by plain extrapolation, it is seen to yield a time lag of the order of 25 years just before the end of the twentieth century. This means that, from the population point of view, the Great Lakes megalopolis is likely to reach, around 1985, a degree of development or maturity comparable to that of the eastern megalopolis in 1960. This refers mainly to population size and densities and does not forcibly apply to the degree of continuity between adjoining urban areas which may lag slightly behind for the Great Lakes megalopolis because of the larger distances of separation between these urban areas with respect to the more concentrated urban areas of eastern megalopolis.

As a result of these considerations, a series of curves was constructed for the various portions of the Great Lakes megalopolis and for the eastern megalopolis taken as a whole (see table 6 and fig. 9). These curves started with the average growth rate observed during the period 1950-1960 and then their subsequent evolution was determined according to the aforementioned considerations; in this way a monotonously declining curve is assumed for the eastern megalopolis whereas a curve, equally declining, but showing a maximum shortly after 1960 and an inflection point shortly before the end of the twentieth century, is assumed for the main portion of the Great Lakes megalopolis (A) in such a way as to reach, during the decade 1980-1990, the same growth rate as that of the eastern megalopolis for the period 1950-1960. This means that roughly the same time lag between the eastern megalopolis and the Great Lakes megalopolis which was shown for plain population figures is assumed to prevail for population growth rates.

A curve roughly similar in form to that of the main portion of the Great Lakes megalopolis (A) is assumed for the Canadian extension (B); this curve, however, starts at a higher level and then moves roughly parallel to the curve for A (see fig. 9, Graph 1).

In a similar manner, curves have been drawn for the smaller units C and D; that for C (the Mohawk bridge) shows an expected maximum in the 1970-1980 decade, illustrating the fact that this accretion between the two megalopolises is expected to in-

Table 6
Annual population growth rates (in percent) for the four portions of the Great Lakes megalopolis and for the eastern megalopolis: middle assumption

Areas	Averages by decade				
	Actual	Projected			
	1950–1960	1960–1970	1970–1980	1980–1990	1990–2000
GLM PORTIONS					
A (main)	2.09	2.05	1.84	1.54	1.41
B (Canadian)	—	2.62	2.54	2.22	2.09
C (Mohawk)	1.75	2.01	2.17	1.925	1.80
D (Cincinnati)	2.46	2.38	2.17	1.88	1.54
EM	1.54	1.41	1.32	1.23	1.14

GLM Great Lakes megalopolis
A Main portion of GLM
B Canadian extension of GLM
C Mohawk bridge
D Cincinnati–Columbus cluster
EM Eastern meglopolis
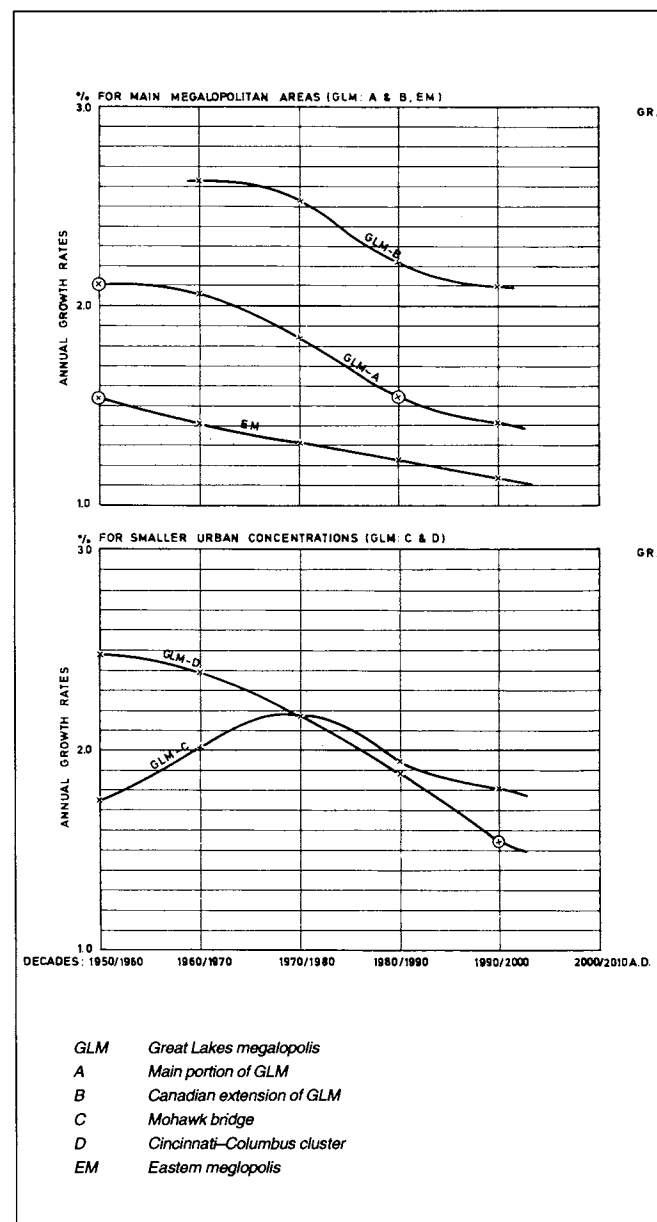
Fig. 9: Curves adopted for annual population growth rates (average by decades).

crease in importance in the near future, whereas later the curve starts declining at a pace parallel to that assumed for the other portions of the Great Lakes megalopolis. For D (the Cincinnati-Columbus cluster), a curve halfway between those for portions A and B has been assumed which reaches the 1950-1960 levels of growth rate for the eastern megalopolis during the last decade of the twentieth century.

It is on the basis of these curves for growth rates that population projections for the four portions of the Great Lakes megalopolis and for the eastern megalopolis in its entirety have been calculated by decades until the year 2000 (see table 6).

● **Peripheral extensions of the initial areas:** From Gottmann's study it becomes apparent that the eastern megalopolis has grown considerably in area in the period between 1950 and 1960 (see E and F in fig. 8). On the basis of this observation it has been assumed that the various portions of the Great Lakes megalopolis are also likely to grow further in area with time.

Based on a time lag of approximately 25 years by the end of this century as discussed above, it has been assumed, for the purposes of the present paper, that the extent of the four Great Lakes megalopolis portions (A-D in fig. 8) will represent the true extension of megalopolitan formations in the Great Lakes megalopolis area around 1985. During the period from 1985 to the year 2000, the four portions of the Great Lakes megalopolis

figure 8 and are referred to here as Case 2). As far as the corresponding population is concerned, the figures for the eastern megalopolis in the 1950-1960 period have been taken as a basis. The figures for the eastern megalopolis show that in 1950 the population in the peripheral area of growth F (see fig. 8) was 10.0 percent that of the inner area E, whereas in 1960 it was 10.6 percent that of the inner area E.

On the basis of these percentages and certain considerations about differential growth rates by regions, figures ranging between 8 and 15 percent for the population increase in these peripheral areas have been assumed for the various portions of the Great Lakes megalopolis and figures ranging between 5.5 and 13 percent have been assumed for the peripheral areas of the eastern megalopolis for their corresponding growth in the period 1985-2000. This yielded corresponding population figures for these peripheral areas as shown in table 7.

● **Further extension by accretion:** Generally speaking, it has been assumed that the previous peripheral extensions will take the form of a zone of roughly uniform width around the initial 1960 definition of the four portions of the Great Lakes megalopolis and the possibility that other outlying major urban centers will be connected to these formations has not been considered. Since this, however, is rather likely, a further step in the population projections of the present study assumes that such

Table 7
Population projections, year 2000, for the four portions of the Great Lakes megalopolis and for the eastern megalopolis for three assumptions: H (High), M (Middle), and L (Low), and for four cases of area extension

Areas	1960 (actual	In Million Inhabitants											
		2000 A.D. (projected)											
		Case 1) Central areas			Case 2) With peripheral extensions			Case 3) With further extensions by accretion					
								a) Narrow extensions			b) Wide extensions		
		H	M	L	H	M	L	H	M	L	H	M	L
GLM PORTIONS													
A (main)	22.7	52.3	44.8	38.6	60.1	49.7	42.1	72.0	60.1	50.9	83.8	70.4	59.6
B (Canadian)	9.5	27.5	24.1	20.7	32.0	26.7	22.4	38.8	32.7	27.6	43.2	36.6	31.0
C (Mohawk)	2.5	6.3	5.5	4.7	7.3	6.1	5.1	7.8	6.4	5.3	7.8	6.4	5.3
D (Cincinnati)	2.8	7.1	6.2	5.3	8.2	6.9	5.7	8.2	6.9	5.7	8.2	6.9	5.7
GLM TOTAL	37.5	93.2	80.6	69.3	107.6	89.4	75.3	126.8	106.1	89.5	143.0	120.3	101.6
EM TOTAL	37.15	69.0	61.2	53.9	78.0	66.1	56.9	85.9	73.1	63.0	105.4	89.5	76.5

are then assumed to grow peripherally in a way roughly similar to that observed for the eastern megalopolis 1950-1960 period. Because, however, the distances between the main clusters or urban areas in the Great Lakes megalopolis area are larger than those of the eastern megalopolis, it has been assumed that these extensions will proceed at a slightly slower rate.

These extensions (as far as area is concerned) are shown in

outlying areas will be initially connected by rather thin "bridges" of urbanization, which will gradually increase in importance so that finally a considerably larger area may become more or less continuously connected to the Great Lakes megalopolis.

Since this process of extension by accretion, i.e., the connecting of smaller neighboring clusters to areas of the Great Lakes megalopolis as previously defined, is very difficult to esti-

mate, two stages in this development have been assumed: in the first stage (Case 3a; see table 7 and fig. 10) only urban clusters lying rather close to the previous definitions of the Great Lakes megalopolis and eastern megalopolis have been assumed to become connected by accretion. These clusters are usually within 100 to 120 miles of the boundary defined for the Case 2) peripheral extensions. To give an example, they are assumed to reach as far as Indianapolis, Springfield, Peoria, and Rock Island, south and west of Chicago, for the Great Lakes megalopolis; or to Portland, Maine, or Norfolk and Richmond in Virginia, for the eastern megalopolis.

If this process of extension by accretion is assumed to take place at a faster rate, then clusters at greater distances may also become connected to the Great Lakes megalopolis and eastern megalopolis by the year 2000. This is shown in table 7 and figure 10 and is here called Case 3b. To give an idea of the extent of this wider zone, it may be mentioned that for the Great Lakes megalopolis it assumes that Minneapolis-St. Paul, St.

Louis, Louisville, Huntington, and Charleston will become connected. For the eastern megalopolis it assumes an extension northwards into Maine and probably even into the eastern Canadian coast of the Atlantic, and an extension southwards into both North and South Carolina which will occur along two lines, one along the coast and the other near the foothills of the Appalachians leaving the agricultural plains inbetween relatively free from urbanization. This push towards the south, as indicated in the Ecumenopolis studies by the Athens Center of Ekistics under the City of the Future Research Project, points to a meeting of this southern extension of the eastern megalopolis with the northern extension of the Florida megalopolis (which a number of authors assume will have already taken shape by 1980) somewhere in the southern coastal area of South Carolina.

Population figures for these two cases of extension by accretion (Cases 3a and 3b), have been calculated as shown in table 7. The figures were obtained on the basis of assumptions as to
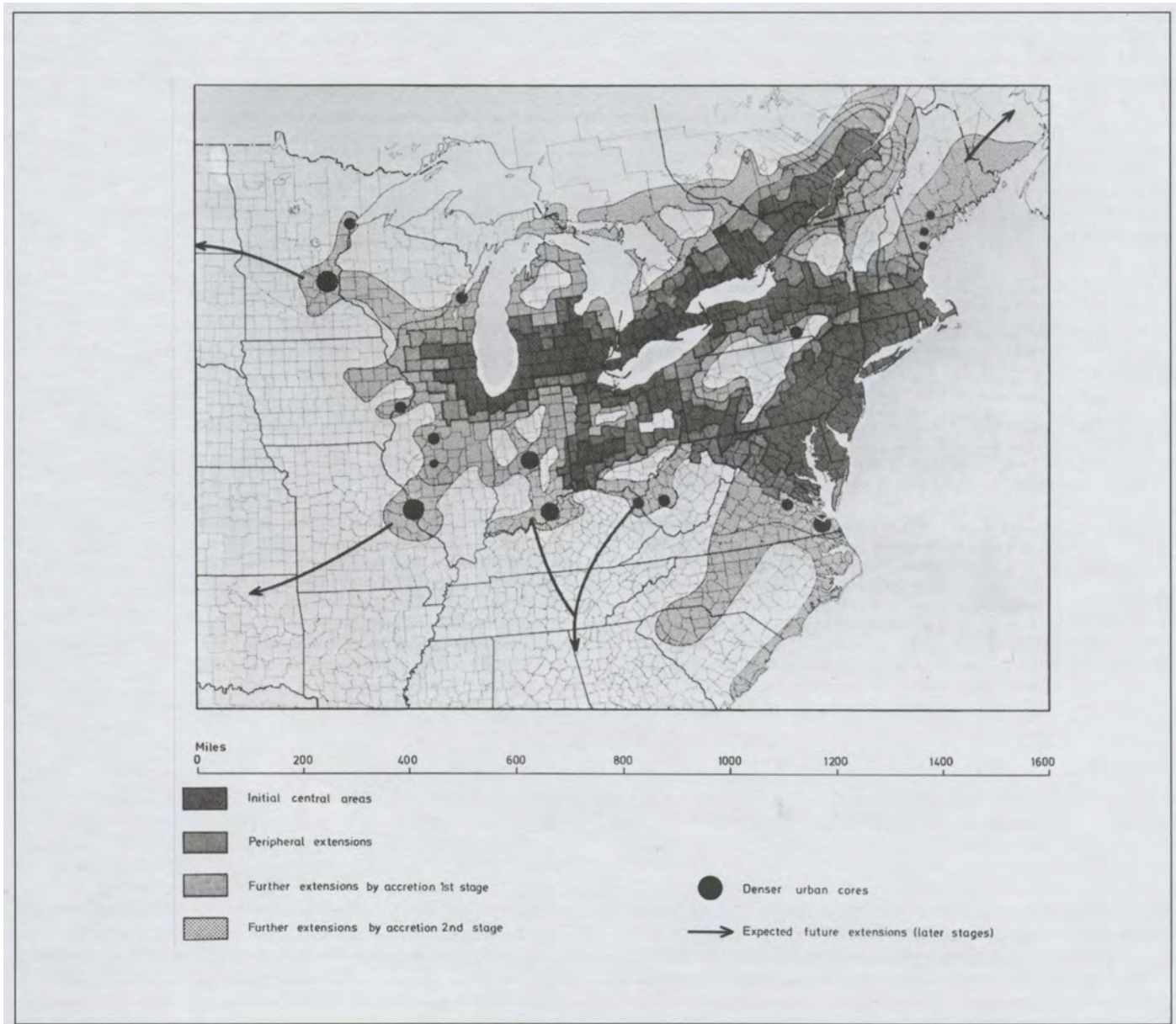
Fig. 10: Further extensions of Great Lakes megalopolis and eastern megalopolis by accretion by the year 2000 (Cases 3a and 3b).

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the form of the curves for population growth rates, similar to those assumed for the initial areas of the Great Lakes megalopolis and eastern megalopolis.

● **High, middle, and low assumptions:** The calculations and figures mentioned so far refer to middle assumptions as to the pace of population growth. In view of the great margins of uncertainty connected with these projections, it has been thought wise to present three types of projections, termed "high," "middle," and "low."

A similar type of reasoning has been assumed for the high and low projections. To give an example of the ranges involved between high and low, it could be mentioned that for the main portion of the Great Lakes megalopolis high projections result in figures approximately 15 percent higher than for the middle assumptions and low projections approximately 15 percent lower than middle assumptions.

Results

The results of the projections made according to the method previously described are shown in table 7. These results are given for the three assumptions, high (H), middle (M), and low (L), and also for the four cases of area extension, i.e., Case 1 for the initial central areas only; Case 2 for their peripheral extensions; and Cases 3a and 3b, for narrower or wider extensions by accretion.

What will be the extent of the Great Lakes megalopolis by the year 2000? The answer to this question is not a simple one. Between the minimum proposed (Case 1) and low assumptions and the maximum proposed (Case 3b) and high assumptions, a wide range of intermediate possibilities can be interpolated. Theoretically, there are eight possibilities of combination of the various portions of the Great Lakes megalopolis: A, A + B, A + C, A + D, A + B + C, A + B + D, A + C + D, and A + B + C + D. Assuming the four cases of extension to apply homogeneously to all portions of the Great Lakes megalopolis, one gets 32 possibilities by multiplying the eight previous combinations by the four cases. Further, assuming high, middle, and low assumptions to apply uniformly to all areas, one obtains 96 possibilities of defining the extent of the Great Lakes megalopolis by the year 2000. Needless to say, if one assumed a differentiation in these combinations, as for example, high assumptions for a given area and low for another, the number of possible combinations would grow beyond control.

In the spirit of what has been said previously on methodology, one could assume as most likely that the true megalopolis by the year 2000 in this area will reach beyond Cases 1 and 2 and be identified with either case 3a or 3b or some intermediate case between 3a and 3b. It is therefore proposed to look at the figures given for 3a and 3b for all three assumptions, high, middle, and low, of which middle is regarded as the most probable. As far as the four portions of the Great Lakes megalopolis are concerned, the most likely assumption is that all four of them will have become firmly connected into one unified urban complex by the year 2000 with a fully megalopolitan character throughout all four portions in the sense of the megalopolis definition for the eastern megalopolis in 1960; it is even probable that many portions of the Great Lakes megalopolis will be in a much more advanced stage of development by the year 2000 than that of the 1960 eastern megalopolis.

Although quite a range of possible definitions of the extent of the Great Lakes megalopolis by the year 2000 is conceivable, the most probable definitions seem to range between Cases 3a) and 3b) for the middle assumption for the "total Great Lakes megalopolis"; the corresponding more probable populations for this probable area definition of the Great Lakes megalopolis are likely to be somewhere in the range between 106.1 and 120.3 million inhabitants versus a corresponding eastern megalopolis

population somewhere between 73.1 and 89.5 million inhabitants.

The corresponding gross densities in 1960, expressed in inhabitants per hectare, were 2.64 for the eastern megalopolis and 1.60 for the total of all four portions of the Great Lakes megalopolis, with A (main portion) and D (Cincinnati-Columbus cluster) exhibiting the highest densities, i.e., 2.38 and 2.80, respectively, whereas B (Canada) and C (Mohawk) exhibited much lower densities, i.e., 0.95 and 0.87, respectively, for Case 1.

Again for Case 1 the year 2000 densities, according to middle assumptions, will roughly double (in some cases they will be slightly less than double and in some others slightly more); thus the eastern megalopolis will become 4.36, the total Great Lakes megalopolis 3.44, with 4.68 for A, 2.41 for B, 1.91 for C, and 6.20 for D. This means that these central portions of the Great Lakes megalopolis, taken as a total, will reach considerably higher densities by the year 2000 than the eastern megalopolis of 1960; actually the main portion A, which was of a slightly lower density than the eastern megalopolis in 1960, will exceed the density of the eastern megalopolis by the year 2000; it will also be seen that the "less developed" portions B and C will still show smaller densities by the year 2000 than the eastern megalopolis in 1960.

If one moves from Case 1 to Cases 2, 3a, and 3b, then the overall densities will naturally diminish. Precise density calculations are not being given in the present report because of the uncertainty of the exact area definition, especially for Cases 3a and 3b. For these cases the reduction of densities for the year 2000 with respect to Case 1 is likely to be, as a rule, of the order of 30 to 40 percent, i.e., densities for Cases 3a and 3b are likely to be roughly two-thirds those given above for Case 1.

Accordingly, the main portion A of the Great Lakes megalopolis in all four cases will show, by the year 2000, considerably higher densities than the eastern megalopolis for the year 1960. If, however, the total of the Great Lakes megalopolis (all four portions) is considered, then densities by the year 2000 are likely to be of the same order or slightly lower than those of the eastern megalopolis for 1960.

It will be seen, in figures 8 and 10, that the boundary between the generalized Great Lakes megalopolis and the generalized eastern megalopolis area is assumed to be provided by the relatively more mountainous portion of the Appalachians. The main "bridges" between this generalized definition of the Great Lakes megalopolis and the eastern megalopolis are expected to proceed along three lines: it is believed that the earliest firm connection between the two will start being formed along the Mohawk Valley; later on, another connection between the Montreal-Ottawa portion of the Canadian megalopolis and the eastern megalopolis is expected to take place along the valley of the Hudson River and Lake Champlain; a third connection is expected to take place over the relatively less mountainous portion of the Appalachians, roughly from Washington to Pittsburgh.

Also in figures 8 and 10, some possible future extensions of both the Great Lakes megalopolis and the eastern megalopolis have been shown by arrows. These can be seen either as extensions of the assumed megalopolitan areas into neighboring areas of markedly less urbanized character, such as the extension of the eastern megalopolis westwards, or as connections between the Great Lakes megalopolis or eastern megalopolis on the one hand, and other megalopolitan formations expected to take shape in the United States on the other, such as the Florida megalopolis or the formations south of Cincinnati and Louisville. Beyond providing an indication of possible future extension of the Great Lakes megalopolis and the eastern megalopolis after the year 2000, these arrows may represent already for the year 2000 some further extensions beyond Case 3b as assumed in the present paper, since in certain cases urban-

ization may proceed at a still faster rate than that corresponding to Case 3b.

Finally it should be stressed that, in the successive extensions of the initial central Great Lakes megalopolis (Case 1 through 2, 3a, and 3b), it is still the Great Lakes megalopolis of Case 1 that retains the main weight of the total population, because of the much higher densities prevailing in this central area; if one looks only at orders of magnitude, therefore, substituting one boundary for the next adjoining one, e.g., 3a for 2, or 3b for 3a, the resulting changes in population are rather small when compared with the large corresponding changes in area.

Subdivision of the Great Lakes megalopolis into urban areas

General

The understanding of major megalopolitan structures will be greatly enhanced if meaningful subdivisions into smaller areas centered around the main urban poles of attraction can be identified within them; actually, it may even be preferable to define larger areas around each major center of urban attraction representing the sphere of influence of each of them in such a way that adjacent areas would not overlap but would either remain in contact or show a separation through an intermediate "neutral zone."

Such an area has been defined with Detroit as a center and has been studied in considerable detail so far[2]; this area has been termed the Urban Detroit Area (UDA) and represents the area of direct influence around Detroit. It is believed that it will be particularly useful to try and define similar urban areas around the main urban centers of the Great Lakes megalopolis so as to understand better their interrelation as well as their relation to the various metropolitan segments.

An attempt has been made to start with such a definition, in a preliminary way, for two more urban areas, comparable to the Urban Detroit Area: one centered around Chicago-Milwaukee, to be called the Urban Chicago-Milwaukee Area (UCMA), and another centered around Cleveland-Pittsburgh, to be called the Urban Cleveland-Pittsburgh Area (UCPA). An attempt has also been made to correlate these three urban areas with the main portion of the Great Lakes megalopolis (part A of fig. 8); this was done only for this main portion of those initial central areas of the Great Lakes megalopolis which have been called Case 1).

Methodology

● **Definition of Urban Areas:** In order to arrive at a first identification of the above-mentioned three urban areas, the maps considered in the analysis part of the study, showing the most characteristic phenomena in the Great Lakes area, were examined. It immediately became apparent that no uniform definition of an urban area around Chicago-Milwaukee could be arrived at easily; for a considerable number of variables, the contours seem to gather very near each other just outside of the boundary of the main portion of the Great Lakes megalopolis in the Chicago-Milwaukee area, thus defining a rather limited Urban Chicago-Milwaukee Area. For a number of other variables, however, the area defined seemed to extend much further out, usually in two ways. In one category of cases the extension took a radial or tentacular shape along the main roads connecting Chicago-Milwaukee with outlying centers ; in other cases the pattern seemed to be, on the contrary, that of a peripheral interconnection of such outlying areas with weaker links of the ring just formed with the central area around Chicago-Milwaukee.

This led to a dual definition of an Urban Chicago-Milwaukee Area which is particularly strong in the southwest, south, and southeast areas with respect to Chicago-Milwaukee, whereas north, west, and east of Chicago-Milwaukee the two definitions seem to coincide, more or less. This is why, pending a more thorough study, two urban areas have been defined around Chicago-Milwaukee, an inner one (UCMA$_1$) and an outer one (UCMA$_2$), as shown in figure 11.

It will be seen in this same figure that the urban areas thus defined for Chicago-Milwaukee do not touch the Urban Detroit Area; a small area, here called the West Michigan Area (WMA), seems to constitute a "neutral area" between the Urban Detroit Area and the Urban Chicago-Milwaukee Area; whether this neutral area will finally come under the influence of one or the other urban area or whether it will be split between these two urban areas is a problem that will require further study to be properly answered.

It may be mentioned that this discontinuity between the Urban Detroit Area and the Urban Chicago-Milwaukee Area is not only based on observations on the material contained in the Detroit studies by Doxiadis Associates and the Athens Center of Ekistics but also appears on some of the maps of the Michigan Transportation Study and other independent U.S. studies.

On the contrary, the definition of the Urban Cleveland-Pittsburgh Area did not seem to present such great difficulties; on the basis of the maps of the previously mentioned reports, a single outlying area could be determined which happens to come in complete contact with the Urban Detroit Area somewhere halfway between Toledo and Cleveland.

It should be stressed that the Urban Cleveland-Pittsburgh Area and Urban Chicago-Milwaukee Area definitions are of an entirely preliminary and temporary character pending further, more detailed studies for their more precise definition. Still, they can be regarded as a first approximation which may serve to determine orders of magnitude for the populations included in them. It should also be remarked that slight changes in the boundaries of these urban areas are not likely to affect total populations very considerably, since the largest proportion of the population resides in their central areas while the outlying areas are much less populous.

● **Population projections for the year 2000:** The population of the urban areas thus defined has been calculated, on a county basis, for 1950 and 1960. The corresponding average yearly growth rate for this decade has been determined and extrapolated up to the year 2000 according to a slightly decreasing curve, in a way more or less comparable to the population projections made in the preceding section.

● **Comparison with the main portion of the Great Lakes megalopolis, case 1:** Fig. 11 shows that the three urban areas previously defined extend considerably beyond the boundaries of the main portion of the Great Lakes megalopolis, Case 1). In order to facilitate the comparison with it, therefore, the three urban areas have been subdivided into two sections: the first section, "a," is included in the main portion, the second section, "b," represents the rest of the corresponding urban area, i.e., its portion lying outside the main portion of the Great Lakes megalopolis. The difference between the two definitions of the Urban Chicago-Milwaukee Area (i.e. between UCMA$_1$ and UCMA$_2$) is called "c," whereas the Canadian portion of the Urban Detroit Area is called "d," for reasons of easy identification (see table 8 and fig. 11).

Population figures for these two sections of each of the three urban areas have been calculated for 1950 and 1960 and projected for the year 2000 as previously described for the total of the urban areas.

Because of the consistency in the form of the curves assumed for the extrapolated annual population growth rates, very little adjustment and smoothing proved necessary to achieve com-
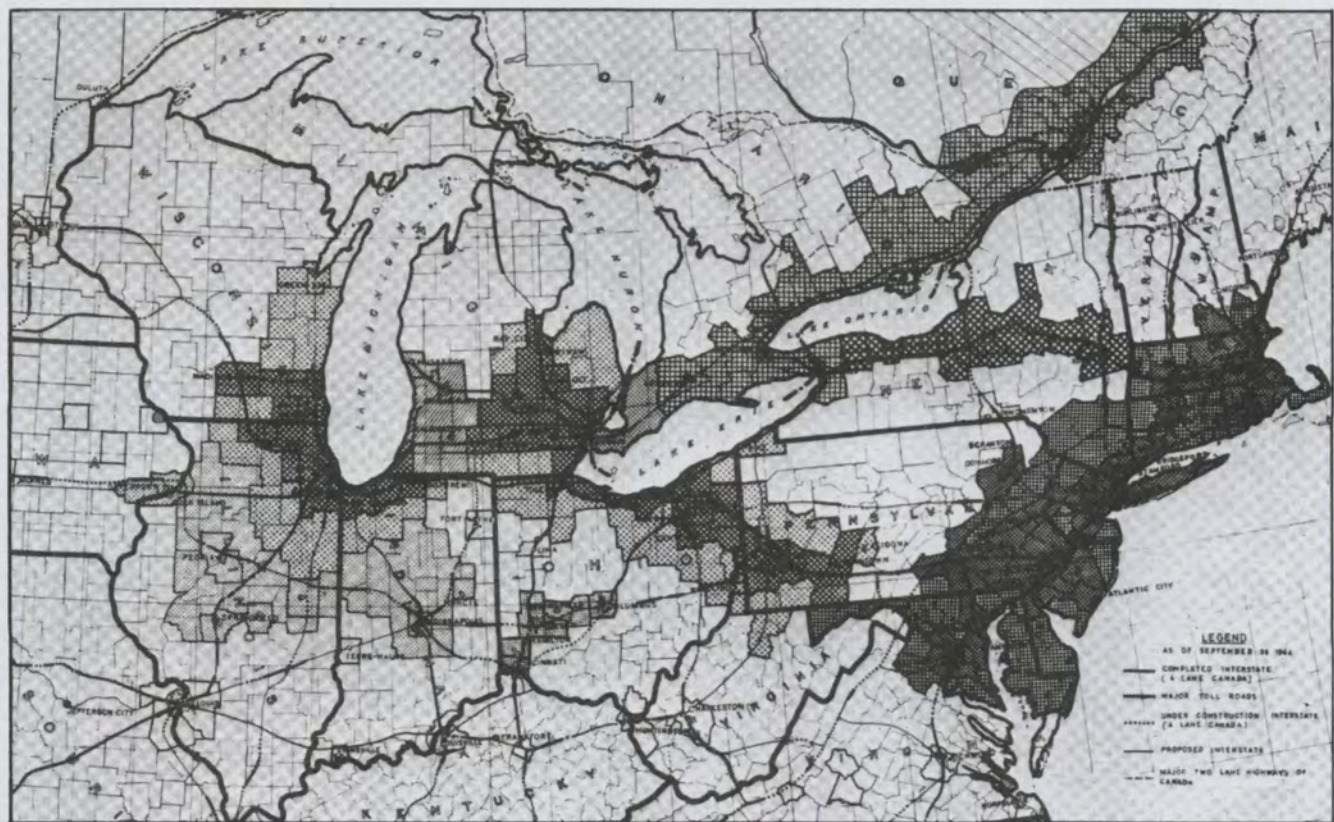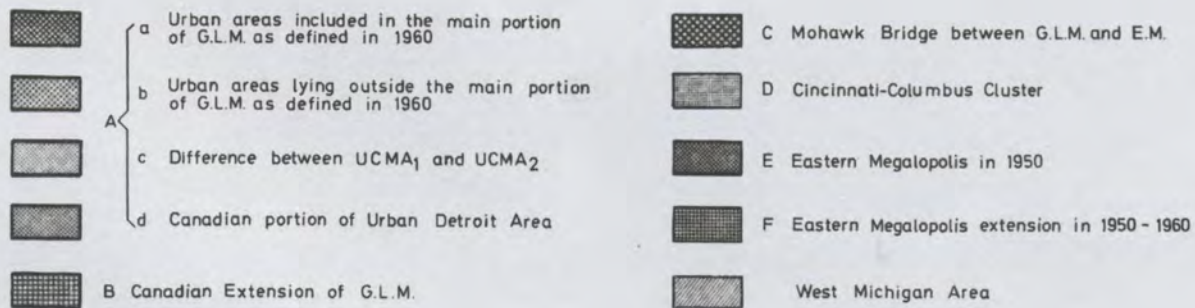
Fig. 11: First definition of urban areas related to the main portion of the Great Lakes megalopolis (area A) in 1960.

plete consistency for the year 2000 population projections: with only slight corrections of the decimals (in this study the population has been expressed in terms of millions of inhabitants), it proved possible to bring into full agreement the year 2000 population figures taken as a basis for the Urban Detroit Area studies (high 16.5, low 13.5) with the corresponding Urban Chicago-Milwaukee Area and Urban Cleveland-Pittsburgh Area figures in such a way that the population of the inner portions of the urban areas, i.e., the three "a" areas, added up to the population projections as calculated in Section III for the main portion of the Great Lakes megalopolis, i.e., for area A, Case 1).

● **High, middle, and Low Curves:** The above-mentioned calculations were made under three different assumptions, high (H), middle (M), and low (L), as shown in table 8. Again it should be stressed that full consistency has been achieved for all three assumptions, between the population projections of the present section, those of the preceding section, and the current population projections of the various studies for the Urban Detroit Area.

for the Urban Chicago-Milwaukee Area is higher than the high assumption for the Urban Detroit Area: on the contrary, the middle assumption for the Urban Cleveland-Pittsburgh Area is comparable to the low one for the Urban Detroit Area, whereas the high assumption for the Urban Cleveland-Pittsburgh Area is only slightly lower than the high assumption for the Urban Detroit Area.

It will be seen that the outlying less dense areas, "b," contain only a relatively small fraction of the total population of the urban areas, roughly 20 percent for the Urban Cleveland-Pittsburgh Area, slightly more than 10 percent for the Urban Detroit Area, and almost 15 percent for the Urban Chicago-Milwaukee Area; this simply stresses the fact to be expected that the bulk of the population of the urban areas will remain concentrated in their central areas, "a," that is, their portion lying within the main portion of the Great Lakes megalopolis as per Case 1.

Table 8
Great Lakes megalopolis population projections, case 1, by urban areas and their subdivisions for three assumptions: H (high), M (Middle), L (low)

| Areas | Population in Millions | | | | |
| | Actual | | Projected for the year 2000 | | |
	1950	1960	H	M	L
A. Urban Areas of GLM					
Urban Chicago–Milwaukee Area (UCMA₁)					
a.	7.549	9.269	23.900	19.900	16.600
b.	1.222	1.437	3.200	2.800	2.300
Total UCMA₁	8.771	10.706	27.100	22.700	18.900
Urban Detroit Area (UDA)					
a.	4.710	5.864	13.400	12.200	11.400
b.	0.676	0.793	1.800	1.500	1.300
Total USA	5.386	6.657	15.200	13.700	12.700
d. (Canada)	—	0.450	1.300	1.000	0.800
Total UDA	—	7.107	16.500	14.700	13.500
Urban Cleveland–Pittsburgh Area (UCPA)					
a.	5.470	6.377	12.800	10.800	9.000
b.	2.103	2.241	3.400	2.900	2.400
Total	7.573	8.618	16.200	13.700	11.400
West Michigan Area (WMA)	0.751	0.957	2.200	1.900	1.600
Total	—	...	62.000	53.000	45.400
Minus UDAd (Canada)			1.300	1.000	0.800
Total USA	—	—	60.700	52.000	44.600
B. Total Great Lakes Megalopolis					
a.*	18.480	22.465	52.300	44.800	38.600
b.	4.001	4.471	8.400	7.200	6.000
Total GLM	22.481	26.936	60.700	52.000	44.600
UCMAc	2.891	3.409	8.000	6.800	5.600
UCMA₂ (Overall total of UCMA including areas c)	11.662	14.115	35.100	29.500	24.500

a. inside GLM main portion, Case 1).
b. outside GLM main portion, Case 1).
c. further extension (only for UCMA).
d. Canadian part of UDA.
* Identical with GLM-A, Case 1).

Results

It will be seen from Table 8 that the projected population figures for the year 2000 for the Urban Cleveland-Pittsburgh Area are slightly lower than those for the Urban Detroit Area while those of the Urban Chicago-Milwaukee Area are considerably higher than those of the Urban Detroit Area: even the low assumption

It will also be seen that the West Michigan Area represents only a small fraction of the total aggregate population of the three urban areas, roughly 3.5 percent.

The above-mentioned calculations refer to the "inner" definition of the Urban Chicago-Milwaukee Area; if the "outer" definition is adopted, slightly higher population figures result, as shown in Table 8.

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Transportation and the future of the megalopolis

Transportation as a unifying factor

The previous analysis shows clearly that we expect a great growth of population in the Great Lakes megalopolis, reaching the order of a hundred million inhabitants by the year 2000 and many more during the twenty-first century. By the end of the twenty-first century the population in the Great Lakes megalopolis as well as in many parts of the world may level off after having reached a new balance between space and man.

While such a growth is reasonably certain, and while it is certain that this growth will take place mostly around the major urban areas which exist today, we can also be certain that new growth will take place along the major axes of transportation and around major points of access to the transportation system, such as, perhaps, major airports or railway stations. Where future transportation development depends mostly on highways, then the urban development may be linear if the points of access are close together, or it may be in separate centers along one line if the points of access are further apart.

Depending on the form of transportation, we shall have different urban patterns. In any case, however, the transportation systems, their configurations, their speeds, and their operational methods will be the greatest unifying factor in the formation of the Great Lakes megalopolis.

The expanding Ekistic fields

If we want to study how this phenomenon of the unification of urban areas through transportation will take place, we must make use of the kinetic ekistic fields (figs. 12 and 13). How far can man move by the use of different means of transportation

within reasonable periods of time, allowing him to commute from place to place during the same day? It is now accepted that many people commute for one hour a day in each direction and there are also large groups of people who commute for two hours in each direction. Whether we will have people commuting for even longer periods of the day and turning themselves into nomads of the urban deserts, or whether we will tend to reduce the commuting time, depends on the goals that humanity will set for its future. It is our hope that commuting time will be reduced.

In any case, the phenomenon we witness today is the phenomenon of expanding ekistic fields caused by increasing speeds of transportation. As we do not tend to reduce the commuting time, but do have higher speeds, a kinetic ekistic field which had a radius of 10 miles two generations ago and 20 miles one generation ago may well today have a radius of the order of 40 miles. If our transportation systems are blended more reasonably within the urban texture this radius might easily expand to 60, 80, and 100 miles by the end of the century.

If the kinetic ekistic fields expand to 100 miles around major urban centers this will mean that the Urban Chicago Area will touch the Urban Detroit Area and the latter will touch the Urban Cleveland Area; the Urban Cleveland Area will overlap the Urban Pittsburgh Area and then the expanding ekistic fields will be interconnected.

This does not mean that people would commute within the same day between Chicago and Detroit or Detroit and Cleveland, because this would mean that they would have to cover two kinetic ekistic fields. It does mean, however, that there will be people living on the fringes of both who will move inside the kinetic ekistic fields of two major cities: Chicago and Detroit, or Detroit and Cleveland. In this way, a new category of people will develop whose interests will no longer be confined to
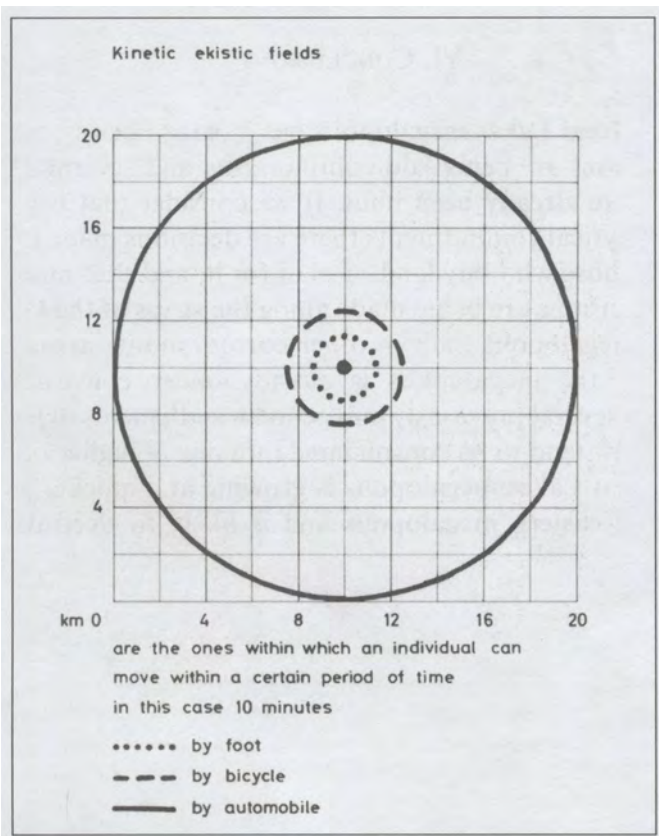
Fig. 12: Kinetic ekistic fields.
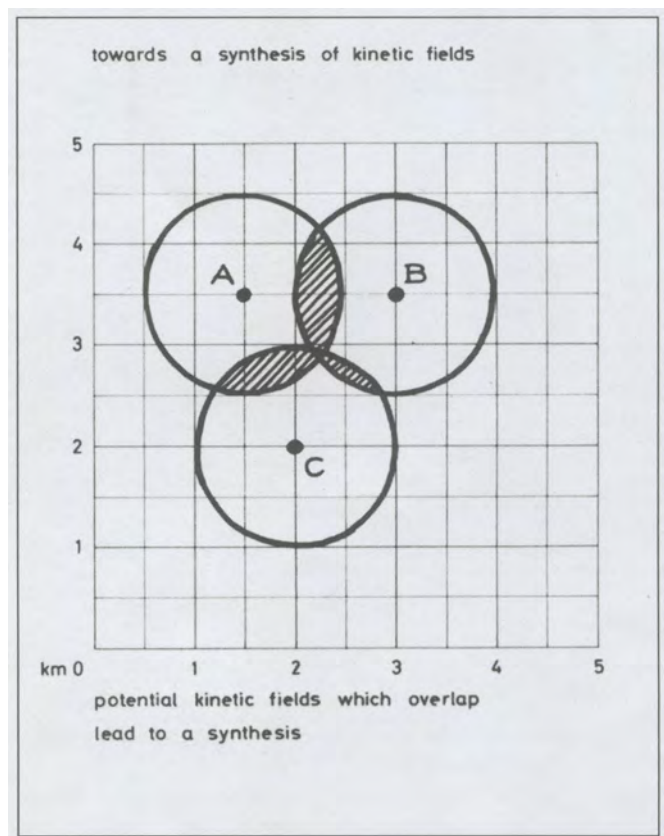
Fig. 13: Towards a synthesis of kinetic fields.

one of the major urban areas as they have been so far, but who will be interested in both; and these people will provide the link which will gradually lead to an even more unified system. The people living on the fringes, the people living on the overlapping areas, are the ones who will act as the connecting elements and lead towards a broader unification of the ekistic fields.

Conclusions

The Great Lakes megalopolis has already been born; its foundations are being laid continuously, and several of its parts have already been built. If we consider that beyond these physical commitments there are decisions made every day by those who buy land or plan for it, and that more of these decisions are being made along the strips of the Great Lakes megalopolis than in other corresponding areas, we see that the megalopolis is already under construction because several previously independent settlements of lower order now tend to be consolidated into one of higher order. The Great Lakes megalopolis is growing at a quicker pace than the eastern megalopolis and is likely to

overtake it and even surpass it in many respects before the year 2000. In view of the above, it is time for us to study not only the different settlements along the Great Lakes which already exist and for some parts of which we can do little, but also the forthcoming Great Lakes megalopolis as a system and those of its parts which will be created from now on. We hope that studies such as the present one, whose purpose is the illumination of this ongoing phenomenon and the projection as far as possible of its future evolution, can help us to follow the second of the roads outlined in the Preface, that is, to invent the future and plan for better conditions within this upcoming major human settlement. This is a task to be undertaken. It is not too early for that; in a few years it may even be too late.

Notes

1. J. Gottmann, *Megalopolis, The Urbanized Northeastern Seaboard of the United States* (Cambridge, MA, M. I. T. Press, 1961).
2. C.A. Doxiadis, *Emergence and Growth of an Urban Region, The Developing Urban Detroit Area*, vols. 1 and 2 (Detroit, The Detroit Edison Company, 1966 and 1967).

Ecumenopolis: The coming world-city

Introduction

Man has been living for thousands of years either in villages or in small static cities. Cities were always static; the symbol of their static nature was the wall. Walls did not exist merely in physical form; they were the most symbolic feature of the city for thousands of years. This can be understood by the fact that where there was no necessity for walls, for example, in the Spanish colonial cities which were created on the basis of well-conceived plans, the city walls which had so strongly influenced man were replaced by wide, well-planted avenues which did not present any hindrance to invaders, but nonetheless provided the inhabitants with those city limits which their predecessors had maintained for thousands of years.

It can be argued that several cities in the past were not static at all. Athens, for instance, underwent an important expansion under the Emperor Hadrian, and Constantinople moved its walls under the Emperor Justinian in order to cover a wider area (figs. 1 and 2).
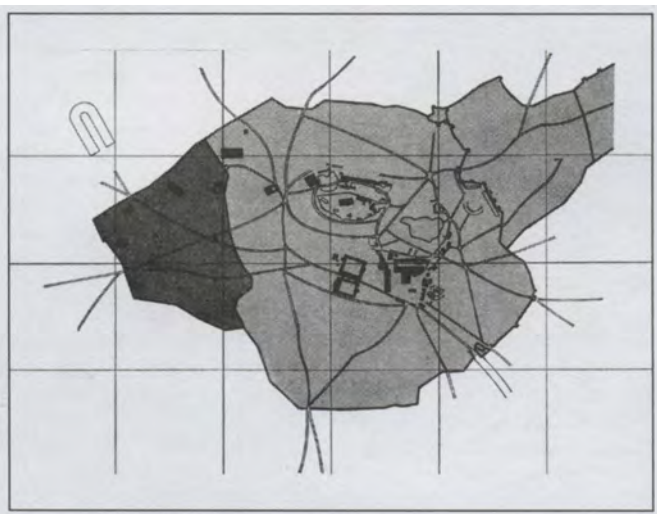
Fig. 1: Athens, example of a revision of dimensions at a particular historical moment – The darker area shows the expansion under the Emperor Hadrian. (*Source:* After a drawing by J. Travlos).
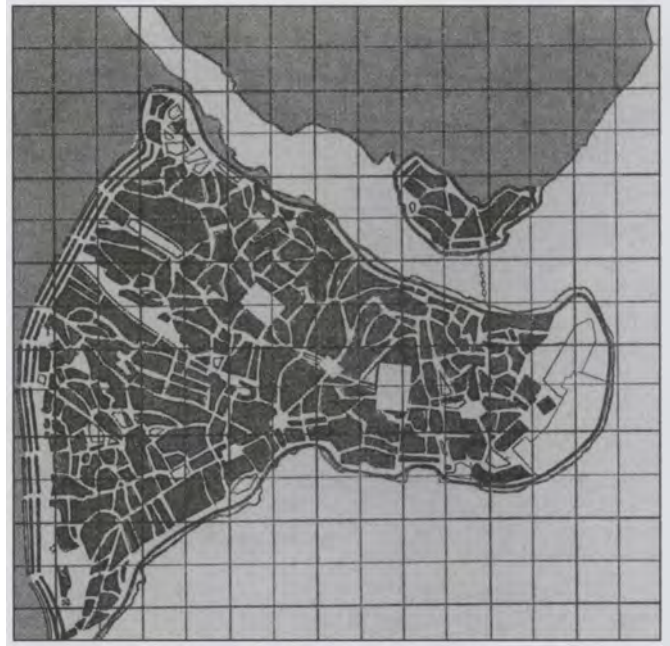
Fig. 2: Constantinople in the 5th century, showing the double walls.

But these very examples confirm the theory of the existence of the static city. In both these cases, as in others, the city was not growing continuously in a dynamic way, but was simply revising the dimensions of its static nature at a particular critical historical moment, when its functions or its importance were changing.

The cities were also small. They ranged from a few thousand to scores of thousands of inhabitants. There were some larger cities like Alexandria and Rome, Constantinople and Peking, which contained hundreds of thousands of people, but these cities were quite exceptional and they did not maintain for very long such large populations. The overwhelming majority of the cities of the old civilizations, down to the seventeenth century, were small, with less than 100,000 inhabitants. It is quite characteristic that in the ancient Greek world, which created the famous city-states, the largest cities comprised only about 50,000 people; and such a famous cultural centre as Athens probably contained no more than 35-50,000 people. A comparative study of the populations of several Greek cities shows that their average population was below 28,000.

In these cities, the elements from which they were formed – the natural setting in which they were built, the man and society for whom they were built, their functions, and finally their

physical structure, the shell – were all in balance. The inhabitants of these cities must have been happy in them, for they did not attempt to change their basic characteristics for thousands of years.

The physical dimensions of the city of the past, with few exceptions, were such that man could easily comprehend the whole, and could easily walk from one end to the centre in less than fifteen minutes. The structure of the city was simple: one main centre or, in the larger cities, one important centre and others of secondary importance. The central administration was responsible for all aspects of life. This administration was in most cases in charge of the whole area. In other cases there were also some small local administrative units, which were really only subordinate branches of the central city administration.

The city of the past, apart from being static and small, had a definite simple structure which allowed man, as an inhabitant, to comprehend it easily, to move without difficulty in a way that served all his needs, and to administer it properly.

Dynamic evolution

On several occasions in this long history, several cities broke their walls and spread out into the countryside, but they have not survived. Those which survived were the typical static cities. It was only in the seventeenth century that cities began to break their way out and still survive. This change, which coincides in date with the beginning of the scientific revolution, is related to the increase in population and to the new technology, both of peace and of war.

The construction of the first railway systems facilitated a much greater urban expansion. Several urban areas began, in the nineteenth century, to grow continuously at a rate which had no relation to the growth of the past. At the beginning of the twentieth century the introduction of the automobile produced a much wider spread of the urban tissue into the countryside.

The evolution of the several types of human settlements can be understood if we follow the patterns of the same area in different periods. First the villages, then the static city, then the dynamic city under the impact of the railway and car, and, finally, the present urban area. From the village through the city, we move to the Dynapolis, to the Metropolis, Dynametropolis, Megalopolis and, at present, the Dynamegalopolis (figs. 3 and 4).

The cause of this urban way of life was the great increase in population. We can easily understand this change if we follow the rate of growth of the population of the earth and of the urban population of the earth. How this influences the city can be seen from the curve of the evolution of the population of the city of Athens, which for three thousand years had under 50,000 people, and then, within a single century, broke the barrier and has today reached the level of two million people.

The result of this population explosion was a great change in the physical dimensions of the city. The walls broke, and the city spread in all directions. The small cities of the past turned into the huge cities of the present.

In these cities, we completely lose the human scale. Man is unable to comprehend the whole. He cannot even see the city from end to end. He cannot understand how to move in it because, while the local areas have identical features, the totality makes no sense for him; he cannot find his way. More than anything, the dimensions have become non-human. Man can no longer walk from his home to the centre of the contemporary city. The example of Athens, where we can compare the dimensions of the city of the past with the city of the present (and Athens is not one of the largest cities in the present-day world), is characteristic of the change in the relationship between man and the city. Such a city has not just
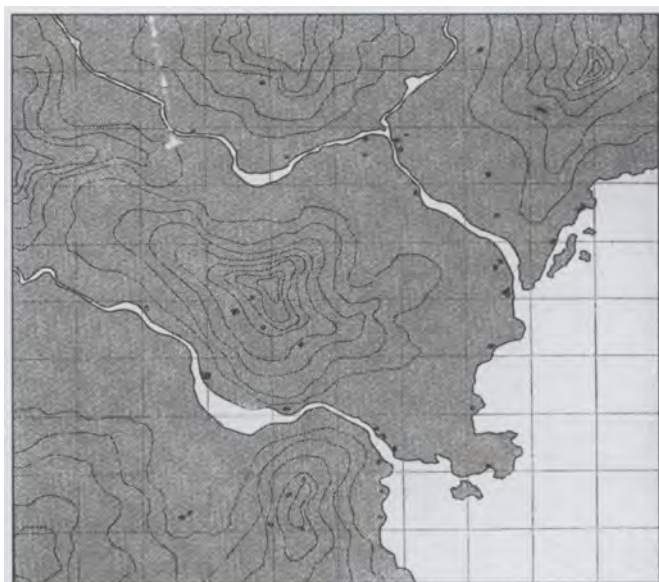
Fig. 3: Stages in the development of the city: Villages in the pre-urban era.

one centre, but many centres; not just one authority, but many authorities. It is no longer easy for man to comprehend, to live in, or to administer the contemporary city, because it has grown out of the human scale, grown out of control. What is more, it is continuously changing.

Actually, the contemporary city is no longer small, static, or comprehensible for the common man. It is a dynamic city. Athens, for example, is growing by 13.5 dwellings an hour. Contemporary cities are dynamic cities or Dynapolises, and very often they are systems of cities growing dynamically, Dynametropolises, and tending to be Dynamegalopolises. Thus, cities which remain small and static are no longer contemporary. This can be understood if we recollect that, although man has created and lived in cities for thousands of years, there are still villages which survive in the era of cities. In the same way, we can see several cities surviving in the era of Dynapolises. New types of human settlements do not eliminate the previous ones. They simply absorb the greatest part of the additional population.

The irrational city

The dynamic city which we have created today does not function properly. We only have to think of its five elements in order to see how irrational it is. Nature is spoiled with every passing day. Man finds himself in surroundings which are out of his direct control. Society is destroying the values that it has established in the past, without yet creating a system of values to replace the former ones and to give equivalent satisfaction to man. Functions are not operating properly; we need only realize that the greatest traffic volume is in the centre of the city, where we have the narrowest streets, in order to understand how irrationally we try to solve the problems of specific functions. Finally, the shell of the city is disintegrating; we do not have beautiful contemporary cities. When we talk about them it is only to veil the fact that we are changing them every day for the worse.

This irrational situation can be better understood if we think of the centres of our cities. We allow our cities to grow all round their centres, and they are being choked to death. Is it reasonable to expect a small child to survive if we surround its heart with a steel frame? It will die. The same thing happens with our cities, the centres of which are surrounded by
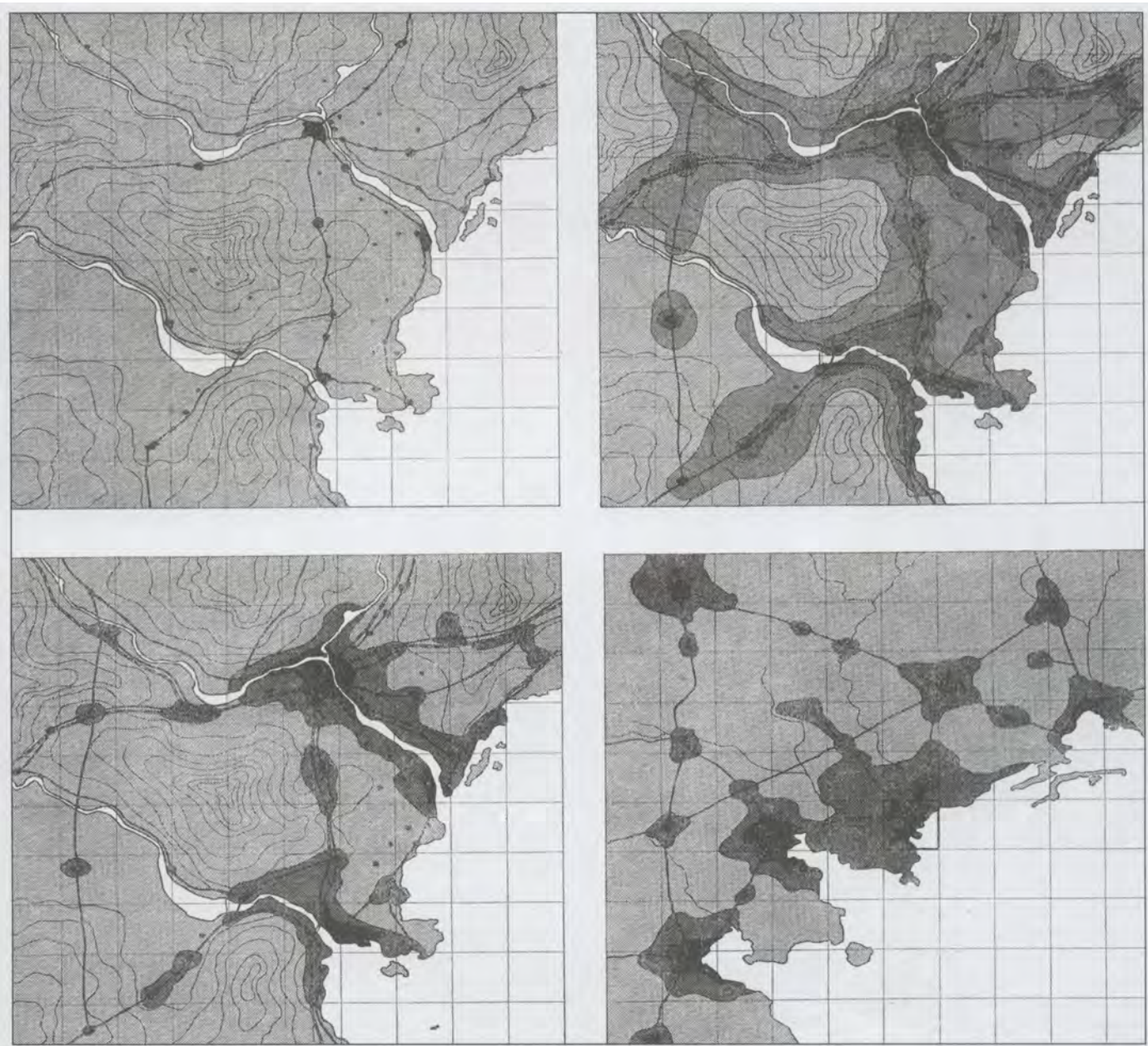
Fig. 4: Stages in the development of the city: City-states in the urban era (top left); Cities as Dynapolis in the industrial and railroad era (top right); Metropolis in the motorcar era (above left); and Megalopolis, the beginning of a new era (above right).

The city

Expansion of the city

The centre

Expansion of the centre

The concentric expansion strangles the centre which struggles with other functions
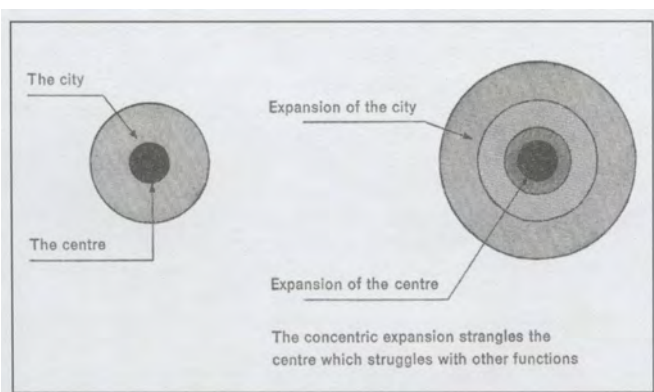
Fig. 5: The static city. By the time problems of urban renewal have been solved at the centre, a new ring of problems around the previous one has been formed.

built-up areas, with the highest investment in the biggest buildings; and still we let our cities grow (fig. 5).

Distances are growing irrationally in the present-day city. We could even say that man has found himself in the following unreasonable situation; he is creating machines which can run at a higher speed, but he finds himself at longer distances from the centre of his cities. The speedier his machines, the longer it takes man to travel to the centre of his city. The very fact that today we cross the large metropolitan areas at an average speed of 15 kilometres an hour *by* car, that is at the same speed at which we were crossing them at the beginning of the century, when we were using horses and carts, shows the irrationality of the systems that we are developing.

Our failure is due to the fact that everything is changing continuously; and, in spite of the cities being dynamic, we try to solve their problems as if they were static. As we cannot

succeed in this, we continually revise our goals. We hear of cities with a maximum population of 2 million people which revise it to 3 million and 4 and 5, and so on, or we hear of cities which dream of surrounding themselves with a green coat, or green belt, in order not to grow, as if man could stop himself from putting on weight by wearing belts. Naturally they fail. The green belt of London is characteristic of these attempts.

In spite of these efforts and conceptions, we look upon the Dyna-polis as a static city. But there is no city in the world which has managed to stop population growth. So it is not strange that all our plans have been failures. Because of such failures, we are trying to ameliorate the present cities with urban renewal plans, but we are not achieving anything, as the rate at which the problems are increasing is higher than the rate at which we can solve them so long as we view the city statically.

Thus, by the time when we may have solved problems of urban renewal at the centre of the city, we have a new ring of problems around the previous centre, and the problems have increased. It is a vicious circle.

If we follow this road, there is no way out. Our cities cannot survive in their present form, yet in spite of that we add population to them. The dynamic cities of the present are being led towards their destruction.

The future population increase
The most important characteristic of the city of the future is related to the increase in population. The present population of the earth exceeds 3 thousand million people. The rate of increase is growing. As things are at present, we should expect a continuing increase in the foreseeable future. There are, however, forces which are beginning to operate subconsciously (as we see in animal societies living in difficult situations) as well as consciously, such as the movements for birth-control.

What order of magnitude of population can we expect in the future? Because we are probably reaching a turning point, we cannot be certain at all. We must therefore satisfy ourselves by assuming a certain maximum and minimum. It is quite probable that the population of the earth is not going to be less than 12 thousand million people by the end of the twenty-first century. For, even if birth-control were to be imposed immediately on all nations, it would take a long period of time to implement such a policy, even if it was agreed upon at an international level. Thus, it has been estimated that we cannot expect a population of less than 12 thousand million people. However, it is much more probable that the minimum population will be of the order of 15 or 20 thousand million people.

Then what is the maximum? If we want to use the whole surface of the habitable earth, entirely for building a colossal world-city, then we shall have a population of 500 thousand million people. This means that the food will have to be imported from other planets. As this may not be reasonable, it is estimated that not more than one-fifth of the total area can be taken over for these human settlements, which means that 100 thousand million people is the maximum reasonable population for the earth. But the earth cannot feed so many people, even at the present technological level. Assuming a normal development of technology, we can expect the population of the earth to reach the figure of 50 thousand million people. Some experts speak of 100 thousand million people; but, on the lines on which we have assumed a reasonable minimum of 20 thousand million, it is now reasonable to assume a probable maximum of 50 thousand million people.

Such considerations lead to the assumption of several curves of the evolution of population, ranging from a minimum of 20 thousand million to a maximum of 50, and pointing to an average of 35 thousand million people, to be reached towards the end of the twenty-first century. However, such a figure should not mislead us into assuming that the total population of the earth will be ten times larger and no more. First, we do not know whether it will break that barrier; second, and more important, the problem of our concern in urban affairs is not the problem of total population, but the problem of urban population. As we cannot expect an increase in the rural population beyond the present level of about z thousand million people (increase in productivity is going to allow them to produce enough food and raw materials for the whole population), a total population of 3 5 thousand million people means an urban population of 3 3 thousand million people.

As the present urban population of the earth is of the order of one thousand million people, we have to understand that, if the growth of the population is spread uniformly round the earth, the average city of the future is going, towards the end of the next century, to have 3 3 times more people than it has now. We have only to think of traffic in this city in order to understand how irrational such growth can be if we do not study the whole situation more carefully.

Dynamic change in the city
However, population growth is not the only dynamic change that we are going to witness in the city of the future. For, as a necessary condition for such growth in population, we shall witness a continuous increase of *per capita* income. Such an increase will proceed *pari passu* with the increase in the number of cars and other machines in use.

Thus, in order to understand the dynamic increase of the city of the future, we have to add all these forces together. When we have done that, we shall see that it is quite probable that the dynamic city is going to increase at a rate of more than 12 per cent per year. The population is increasing by 3 or 4 per cent per year, the *per capita* income is increasing by 4 to 5 per cent in the urban areas and, apart from that, there is a necessity for social programmes to catch up with the accumulated problems of the past; and we are going to have a greater increase of investment in the urban areas than in food production, for example, as gradually more and more people come to be adequately fed (fig. 6).
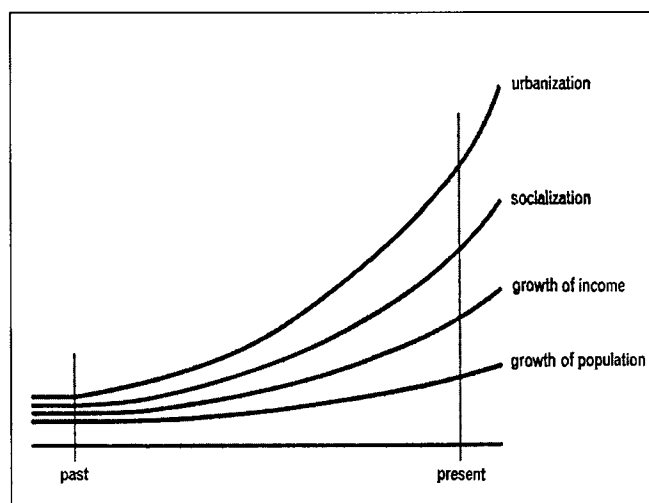
Fig. 6: It is probable that there will be a 12 percent increase of the dynamic city, a population increase of 3-4 percent yearly, a per capita increase of income of 4-5 percent.

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Apart from this higher rate of the dynamic change of the city, we also have to realise that, in consequence of the growth of cities, we shall have added functions because of the change of the order of magnitude in the city centre. In a small city with few functions in the centre, growth will demand that these functions shall be supplied to the whole population of the city, and therefore centres of this order will have to be multiplied. But in addition to this, we shall need new centres to offer services of a higher order, such as centres for administering the pre-existing centres of a lower order. In this way we not only have a dynamic increase of the city, but also have a change in its very structure as well, through the addition of functions of a higher order.

With all these additional functions that we have witnessed up to the present and shall witness even more in the future, there will be lower densities in relation to the area. This looks quite strange, because we normally think of London as the London confined within the city walls which are filled with multi-storey buildings, or of New York as the city of skyscrapers. But if we think of our metropolitan areas as the great urban agglomerations which they are, we shall find that their densities are continuously diminishing because a much larger space is required for the fringe: residential areas for systems of transportation of a higher order and modern industries, shopping-centres, etc., which are expanding in area more than in height. The result can be seen in the very fact that, whereas in the ancient walled cities we had densities from 150 to 200 persons per hectare in the ancient Greek cities and of several hundred per hectare in other over-congested cities – in ancient Rome or in the cities of medieval Europe and of the East – the densities of present metropolitan areas are below 100. Tokyo's density is 57, New York's is 42, and London's is 17 persons per hectare.

Towards a world-wide city

It is natural that, with a population of perhaps about 3 5 thousand million, and with diminishing densities in the urban areas, we may have a total city surface 3 3 times larger than the present one, and perhaps 60 or 100 times larger. When this happens – and we are heading in this direction – most of the cities of the world are going to be interconnected into a world-wide network, into a single worldwide city. This is not a new phenomenon. This evolution started in the seventeenth century when cities broke out of their walls and absorbed the villages next to them, and then absorbed other cities, till gradually the cities merged. The process is already in full swing. The Megalopolis of the East Coast of the United States – where we have practically one continuous urban area from Boston to Washington over a distance of hundreds of miles – shows what we have to expect.

This world-wide city or universal city is not going to be uniform. Unlike the city that we had in the era of static cities, when all cities were practically similar to each other in conception (small, static and simple in structure), the city of the future is going to have parts which will differ from each other, according to their main characteristics and the reason behind their creation. The city is going to have very large and wide areas expanding in all directions, and other areas which will be relatively thin and linear, connecting the massive expanding areas. This form is going to be imposed on the city of the future by three forces. Concentric force is going to bring people close to the existing urban centres, and this process of attraction is going to continue. If the expansion of some of them is checked by topographical and geographical features, as in Rio de Janeiro, then the city will flow into the nearest valleys or plains. Linear force is going to draw out branches of the city along the main lines of communication: roads,

canals and railways. The third force will be aesthetic; big parts of the city of the future are going to be drawn towards the coastal regions: lakes, shores and other beautiful areas. What was impossible in the past can now become possible because of the automobile.

The approach of disaster

Let us now think of all these pressures which are going to be brought to bear on the existing urban settlements: 3 3 times more people in a century and a half, an area 60 to 100 times larger, and a much greater number of cars and machines. The centres of the existing cities are going to be choked to death. The world-wide city which is being born will be asphyxiated in its own cradle. Present-day city centres simply cannot withstand these pressures.

The city is going to destroy many parts of the natural landscape. At present it is spreading without any respect for natural contours or vegetation. The bulldozer technique shows on a small scale what we shall witness in the future on a much larger scale. The natural landscape is going to be lost. The natural skin of the earth is going to lose a large part of its vegetation as the city, in its spread, uses more and more chemicals and insecticides, and opens more and more stone-quarries in order to supply itself with additional materials for growth. All these forces will eliminate many of our areas of natural beauty. To this we must add the contamination of water and air, which is already dangerous and will grow worse at a much higher rate. Many natural values will be lost in the process of constructing the world-wide city.

In this city, man is going to find himself even more confused than at present. The scale of the city is going to be increased beyond his comprehension. He will have to rely almost completely on mechanical means for transportation and communication.

Society does not give any indication that it can be better organized in such a city. We simply do not see the trends yet. Man is already unable to impose metropolitan government in many of the cities of the world. The importance of the surviving local administration is over-emphasized in an organism which has nothing to do with the cities of the past. Many social phenomena, like the behaviour of youth, show that we have not been able to organize ourselves in the present city; and, if the present trends continue, these phenomena forbid us to hope for a better society in the city of the future.

Functions remain irrational. In the process of modernizing our cities we are eliminating the centres; two-thirds of the central four square miles of Los Angeles have been taken over by highways and parking. And we are losing many of the values created in the past; we can no longer see either the Piazza del Campidoglio or many other important squares of the past without being bothered by the omnibuses which stand between these monuments and us. There is no reason to expect that we shall behave better in the future.

Finally, there is the present ugliness of the shell of the city, where we have the contrast of the skyscraper with the slums which have survived from previous eras. Because of the irrational way in which the present city has grown, this ugliness is going to be accentuated still more acutely. Many of our streets are going to look much more like traffic-trains than streets for man. There will be nothing left of the public spaces which man has created for his service and pleasure for thousands of years.

In such a city, man is gradually going to escape more and more into buildings. He will gradually become a troglodyte. Buildings will be more effectively insulated from external noise, fumes and climate. And, finally, nobody will worry about what happens outside the big buildings when man, the

displaced person of the city, is going to be in exile.

Such an evolution will lead the city and civilization towards disaster.

Looking into the darkness

If we now assume that we do not have any preconceived idea about this urban settlement of the future, we have to start looking into the darkness, as we do not have anything on which to base our assumption. Actually we have only accepted the facts that there will be people for whom there will be settlements, and the settlements are going to be urban. They will not be connected with the production of food through agriculture.

Beyond that, though, we do not have anything on which we can build our structure of the future. We have only one road to follow, i.e., to assume that the settlements to be created are not going to be the ones we have been anticipating, the ones in which we ' are going to have a balance between all forces of economic, social, political, technological and cultural aesthetic value, but only some of them, or only just one category of them. If so, then we are going to be led towards some extreme solutions. If we try to understand the extreme solutions, then we do study the limits towards which even wild imagination can lead; then, by accepting or rejecting those extremes, we can gradually be led to the assumptions on which we can work. We can draw some conclusions which will have a certain value for our projections into the future.

This is what is attempted in this part: A survey of extreme solutions which may be reached if we will not try to create a balance of all forces, which enter into our gate, which are going to be playing a role in the future. In order to achieve it, we try to disentangle ourselves from the present urban settlements, and from any commitments related to them. We look then into the different assumptions by assuming that only one of these forces plays the only role in the future.

● **The pure economic solution:** If we assume that the urban settlements of the future are going to be controlled only by economic forces, then they will gradually turn into a machine, which is going to guarantee to the people the highest level of economic activity; this is going to guarantee the highest income, and this is going to be then the settlement where we will have the idealization of purely economic goals.

An urban settlement of this kind is going to be an extremely rational settlement, where people are going to be related directly to the production which they may achieve. In such a settlement, the heart of every built area is going to be taken by the factories. These may be producing food, or may be factories for synthetic foods, or pools, or fields for cultivation of food, or they may be factories producing industrial goods. The residences are going to be all around them, so that the shortest time will be required for people moving from their residences towards their places of production.

The residences are going to be designed in a way to guarantee the least loss of time for any one moving out of his "bed into his bath, into a breakfast room, towards a factory. This will mean that we may have skyscrapers, the upper parts of which will be taken by living quarters of the babies, infants, the children which are not going to move towards the places of work, therefore they should not come into the lower floors, and create hindrances for the people who will have to move towards the sites of production. Lower floors are going to have the residences of everybody related to the production. Even lower, these people are going to have all the facilities which are indispensable in order to keep them in good shape, in good health for production purposes. Thus the younger generations are going to live all their lives in the upper floors, until

they are ripe enough to be trained for production, and then they will be moving into the lower floors, and after being trained, they will move even to lower floors, where they will reside, and every morning they will move from those floors into the first floors where they will find themselves directly in a great factory. If they have to work in the fields, then the elevators will take them into the tractor station from which they will move directly into the nearby fields. If they are assigned into a new field, then they will have to move into a new skyscraper, in order to find themselves in the vicinity of that field. Even elevators, then, may be too time-consuming, and they may be replaced for the producers by the same devices which the firemen are now using in order to demobilise as quickly as possibly and the only difference will be that the people will now be running towards the new equipment where they are going to replace somebody else who will be returning with the same means with which they came, and using the same quarters which they have just left a few minutes ago, in order to save in residential space.

In such settlements, every living person will "be turned into a well-oiled machine which is going to pass through the production line from the top of a skyscraper to the bottom of it until it is unable to produce any more, in which case it will move most probably into the underground cemetery, which will be under the skyscraper, or, if this will be more economic, into a special room where it may be turned into chemicals to be used for plastics which are going to enter the production lines.

● **The extreme social solutions:** This will be the idealisation of the communal system. In such a case, the whole emphasis will be only on functions of the community. The community hall will be the nucleus of every settlement. Around it there will be special classrooms, special halls for community functions, the restaurants, the kitchen, and in the outskirts there will be the rooms which are going to be divided into categories for men, women or for mating people, and separately for children of all ages. In this way, the only life will be the community life, and all settlements will demonstrate in conception and design this central role of the community control room.

In such a case, it is quite probable that gradually it will be understood that there will be no necessity for special quarters for people, as they are not going to have any functions which are going to be performed in the special private quarters. It will be easily then discovered, that what every man needs is only a place to sit on, and a place to lie on. The next step will be a new design which will combine an armchair with a bed. Special push-button techniques are going to be turning the chair into a bed. The only space required for every person then around them will be very small. Just what is necessary to give to every person the possibility to move freely in an armchair, or in a bed. Once he moves out of them, then he should belong to the community organization. Such a solution is going to lead easily to the conclusion that what everybody needs really, is a structure allowing him all the room within it, and this may be turned into a plastic bulb, which is going to protect every person from cold, rain and wind, by providing it with an air conditioned, healthy atmosphere. Thus, it will be possible, as the plastic shell is going to be very light for every person, to transfer his own cell with him. Thus, persons are going to be turned into a kind of fortresses, moving with their own shells, with their own cells, and always trying to spend as much time as possible in the only buildings which will be available, which will be the community halls, and community facilities.

● **The extreme administrative and managerial solution:** This will mean the idealization of the administrative machinery, which is going to have the full control of everybody. In

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this case, the central team of every settlement, is the admin-istrative headquarters of it. From it, they can control the movements of everybody. They can direct the workers to-wards their factories, at the time required. They can direct the school children towards classes in which they are going to be taught exactly what the Management of the city thinks that they should learn every day. They will move people in their leisure hours towards such places where they are going to be taught how to respect and how to serve the central Govern-ment.

● **The extreme technological solutions:** The solutions can be of several kinds. We may have the skyscraper solution. The whole earth then is going to be covered by the same type of prefabricated skyscraper.

We may have the whole population living inside the earth, in order to leave the whole surface for cultivation, and pro-duction of food. We may have the submarine solutions, if it will be proved that it is more economic to settle the people into great submarines in the bottom of the seas, instead of excavating into the earth.

● **Aesthetic extremes:** In such a solution, the central theme of every part of a settlement will be the cultural hall, a com-bination of a museum, a park, and a cathedral where people will be spending all their free time moving to the tune of music from one room into the other, where they will look at, they will hear, and smell the best combinations of shapes, colours, tunes, odours and tastes.

● **The combined extremes:** We can now understand what types of settlements we are going to have if we are going to combine the extreme technological solutions for example, with the extreme social ones. Then we will reach types of set-tlements which are going to combine all forces, which are recognized as important ones, for the achievement of a set-tlement where everything is going to be controlled by certain very strict rules.

● **The romantic solutions:** It is natural that such considera-tions lead many people to think of much more natural solu-tions, of solutions allowing for complete freedom, of solutions allowing people to go back to nature, and live the pastoral life they have been dreaming of. A simple pastoral life though is going to mean a reduction of the numbers of people on this earth. Thus it is against the assumptions of development we are making, and has to be crossed out as an impossible solu-tion. It may turn into a solution to follow a great disaster, where the numbers of people are going to be reduced, on this earth, to a very important degree.

Conclusions

It is quite clear, that we cannot accept to follow any one of the previous roads. If we leave some forces to get the complete control of the situation in the future, then we are led towards inhuman solutions of the urban settlements. These inhuman solutions are the result of controls, which are exercised on humanity. Without them we cannot have any of the extreme solutions we have described, as people are tending to be served by several kinds of forces, and in order to give the complete control into one category of forces, they must give the control of the whole situation to a special type of persons which are going to lead towards a tyrannical settlement, where the tyrant will be a certain group of people who will be serving only one category of forces.

It is quite natural to conclude that we cannot follow any road leading to such a tyranny of one category of forces.

The solution cannot also be a romantic one, it cannot be a return towards other types of life, such as those of the past. This will mean a reversal of history, for which nobody is pre-pared, and even if some are prepared, this cannot be taken into consideration, as it will mean the disappearance of the greatest part of humanity.

We have reached therefore the point to look for a solution, which is going to relieve us from all the ventures of moving backwards or coming under the full and tyrannical control of one set of forces.

The march towards survival

There is a necessity for change. Present trends have to be studied, evaluated and, if necessary, reversed. It is quite clear that in many respects we have to change our road; we must set new goals. We cannot go on looking upon the city of the future as an extension of the city of the past. It is true that in some ways it is an extension of it. For example, the houses of the past and those of the present are not very different; they will probably not be very different in the future, as the dimensions of man have not changed, nor have his needs within a house. He always needs a bed of certain dimen-sions, a table of certain dimensions, a ceiling of a certain height. There is no necessity to think of a house in novel terms.

In the same way, however, we must think of minor units, the small public space, the neighbourhood, the small community – and these have at present been completely changed by the invasion of the automobile and machine, although this did not necessarily have to occur. We have to be careful to deal with these urban units with much greater respect than in the past. For thousands of years man created such units quite suc-cessfully. Why not learn from them and guarantee a historic continuity?

Dynamic cities: towards proper solutions

We must march towards a world-city. How are we going to do this? We are certainly moving towards this city, but the way we are moving ensures disaster rather than survival and proper development. The question is not one of proceeding, but of how to proceed in the right manner.

To answer it, two goals must be defined. The first is to deflect the present line of march in order to save the existing human settlements which are being strangled. This opera-tion, properly understood, will dictate our course in its first steps. Second, by properly picturing the world-city, we can gradually divert our efforts from the immediate solutions for survival towards long-term goals which will serve man posi-tively. We cannot sacrifice the present in order to create the best solutions for the future. This is why we have to change our course immediately in order to meet the present situation. On the other hand, we cannot sacrifice the future in order to avoid inconveniencing our contemporaries. Thus we have to set long-term goals. It is the combination of short-term with long-term goals that will determine our line of march towards the future.

Our first goal is to achieve the best possible in the present. Our real problem today is that we are dealing with dynami-cally growing cities without really understanding that they are dynamic and no longer static. If we are to deal with such cities, we have to set the ideal goal for man. Up to now, man has conceived several types of ideals, but they have all been static. We now have to create the ideal dynamic city, or the ideal Dynapolis.

We have several cases to work with. The most typical is that of a round city which grows in concentric circles. This city has only a simple heart. If we let this city grow, as we are doing at present, it will finally strangle its centre. How can we avoid this? We are dealing with a city which is besieged by its

own body. In seeking to escape from this besieged city, we cannot break out in all directions, as we are doing at present, for in every besieged city we have to break out in one direction only, the direction of least resistance. We have to let the centre grow in this direction. It will grow into a larger area than the present one. This area is going to attract the new parts of the city all around it; but then we have to foresee the next stage, which is another expansion from the centre in the same direction, which again attracts the city all around it. By continuing this process we shall create a dynamic city which is parabolic, with a parabolically expanding centre. If the city grows continuously, then it will continue as a parabola. This can be called the simplest form of the ideal Dynapolis. If this city later becomes static, then the parabola will close naturally at its end (fig. 7).
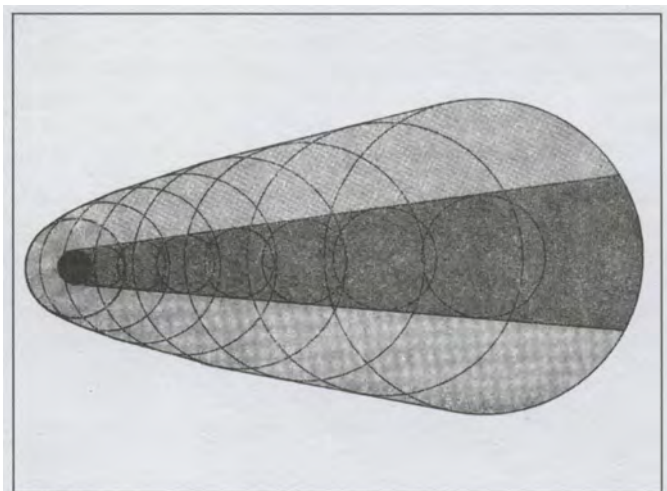
Fig. 7: The simplest form of the ideal Dynapolis – The expansion in one direction allows the centre to expand without difficulty.

New Dynapolises – The axis of growth

We also have the opportunity for creating new cities. But this very seldom occurs. We have fewer opportunities for creating a dynamic city, because this kind of city has not been understood. Lately, though, we have had two cases of new cities that have been obeying the principles of dynamic growth. These are the cities of Islamabad, the new capital of Pakistan, and Tema, the new port town of Ghana, adjoining its capital. These are examples of ideal Dynapolises of the simplest form, implemented in cases in which there were no commitments at all (Islamabad), or in which there were few commitments, so that the areas took the proper shape right from the beginning.

Islamabad has been conceived as a dynamic city in a landscape at the foot of the Margalla hills. The heart of this new capital of Pakistan is now under construction. The city is going to be small at first. What else could it be? Any new organism has to start from a small nucleus. This nucleus is going to contain those functions that are indispensable for a new capital: an administrative centre for the whole country, a cultural centre, a bank, an institutional and business centre, with corresponding residential quarters and facilities. This city, which in its first phase will have 50,000 inhabitants, is going to grow continuously until it will contain 2 million people in the foreseeable future. It has been planned, therefore, for 2 million people. But it has been conceived as a city which can grow from 50,000 to 2 million people while remaining

compact and self-sufficient in every phase, and it will also be able to grow from 2 million to 5 million and even more without changing its structure or sacrificing the first phases to the future phases or vice versa.

The city of Tema was conceived as a Dynapolis after the first communities were planned and built, though without any commitment towards its centre. Thus, it would be conceived as a city of 100,000 people in its first phase, and this initial figure would grow into hundreds of thousands. The fact that it is close to the sea and to the capital city of Accra, with which it will one day coalesce into a single urban area, has led to the decision to establish an axis of growth. With its back to the seafront, the city is going to grow inlandwards exactly as the capital city has already done, and this in a natural way, as many cities have grown under similar conditions, regardless of whether we have noticed that or not. A study of the whole area has proved that, between Accra and Tema, a third centre could and should exist, which, also having its back to the sea, would likewise grow inlandwards. Thus we should have three Dynapolises, all growing parallel to each other from the sea inlandwards, and this would allow the population of the metropolitan area to grow from some hundreds of thousands of people to millions.

Re-shaping existing cities

There are cases in which the theory of the ideal Dynapolis can be implemented not only in new cities, but also in existing ones. Such proposals have been worked out for several major cities such as Washington, Copenhagen and Beirut, and they have been implemented in some – for instance, in Khartoum. In the metropolitan area of the new capital of the Sudan there are three cities, Khartoum, Khartoum North and Omdurman, on the three sides of the two Niles. The major problem of these cities lies in the fact that commuting from one to the other requires the construction of bridges or, perhaps in the future, tunnels which must be quite long and very expensive. The major problem, therefore, was how to create a city which would not be spending its budget on the crossing of rivers. An analysis has proved that the major part of the future expansion must be confined to one of the cities, with the others becoming static as soon as possible, in order to decrease the number of crossings over the river, which otherwise will increase enormously. Such an analysis has led to the formation of a plan for the metropolitan area of Khartoum which provides for the dynamic growth of the city of Khartoum and the gradual stabilization of conditions in Omdurman and Khartoum North.

Such a plan, which has been approved, is now being implemented. It allows for the growth of Khartoum in a dynamic way which will guarantee the proper functioning of the whole metropolitan area at a minimum cost for its inhabitants.

Similar solutions have been suggested for several types of cities such as Washington, which has to grow in one direction, probably along the Potomac River, in order to avoid the great pressures which are coming in from all directions; or Beirut, which has to develop a centre, far from the present one, with its back to the sea and facing inland; or Copenhagen, which, in order to save the cultural values invested in its centre, must develop a pattern of landward growth, for it has been estimated that the present population, which is about 1.5 million, is going to grow to 5-5.5 million a century from now.

There are cases, though, where it is impossible to impose a theoretically ideal Dynapolis on the existing city for a number of reasons. Such a case is the city of Baghdad, where the dominant feature is the river Tigris, along which Baghdad was developed in the past in a practically linear way, and along which it will have to be developed in the future for many topo-

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graphical and climatic reasons. In this case the natural form of the city is dynamic along the river. Thus, Baghdad cannot turn into a uni-directional Dynapolis. Because of this, it will always be subject to pressure on its centre, which is preferably going to be in a central location receiving pressure from at least two directions. In order to avoid these pressures, the master-plan of Baghdad has been conceived with a view towards growth, not only along the Tigris, but also in a vertical direction, for otherwise the roads near the river would be choked to death. Such growth in a vertical direction is not going to succeed unless the new parts of the city have advantages over the parts near the river. This is why it has been suggested that the pattern of the river should be repeated by digging major canals parallel to it – a development which would draw the city out in parallel lines. Such a solution will not have the advantages of the ideal Dynapolis, but here the practical limitations set by the landscape show that we should not speak of theoretical solutions, but should try in every case to solve the problem in what is the best possible way in the local circumstances.

What is ideal for one city with one centre which is surrounded by a uniform plain, such as Tema, is not ideal for the city of Baghdad, where the dominant feature is a great river.

A different situation is represented by the city of Athens, which does not lend itself to the implementation of the ideal Dynapolis. Here the basic feature is the fact that the city is surrounded by four mountains and is confined to a valley which imposes its own rules. The major part of the valley has already been filled by densely built-up communities. Thus, there is only one direction for expansion, namely to the northeast of the city. This is the only natural direction for expansion, but it is no longer a practical direction because of the densely built-up central areas connecting the present centre with the new one that would have to be created to the northeast, at the cross-roads of the national highways. In such a case the dynamic solution for Athens turns out to be the creation of a new centre in the non-developed area. This will act to relieve the existing centre of Athens from all the pressures on it, and will allow it to survive as a normal centre for a normal metropolitan area that now serves 2 million people. The additional millions that are to be expected by the end of this century, and the millions that are going to be added later, will need the new centre which has already been proposed and is now under discussion.

Network of cities

However, there are cases in which the situation is not so simple. These occur where we do not have one single city, or a metropolitan area with one definitely predominant centre, but rather networks or centres serving urban areas which have already coalesced with each other. In such cases the solution no longer consists in letting the present centres expand, for they are usually choked and cannot expand in any direction without affecting their own areas as well as the adjoining urban areas. In most of these cases the real solution lies in deciding that, as these areas have coalesced and have no more space in which to expand, they should be turned into static areas as soon as possible. The additional population which will be attracted by the major city will then have to be absorbed by new centres; and, as the whole area is going to grow into one of a higher order, a much greater centre has to be created outside the built-up areas in order to relieve pressure and to serve, not only the existing cities, but also the new cities that are going to be created in the surrounding areas.

It becomes quite clear that, in the near future, we shall have three phases in the development of dynamic cities: the

new cities which, as Islamabad and Tema prove, can be a great success and which must be multiplied if we want to save our cities; dynamic cities following the principle of an ideal Dynapolis where this is possible (and here we shall have to conceive patterns allowing our present cities to expand dynamically); finally, as this is not going to be possible in all cases, we shall have to decide that several cities will have to stop at a certain stage, while other cities in their vicinity will have to cope with the new population, to become centres of a major order and to provide services for the widening urban areas.

We will certainly also have cities which will remain static because of their locality or their functions. These will be mostly small cities, in outlying areas which have been by-passed by present trends, or cities which are in such small areas or valleys that, for them, there is no possibility of major growth. Such cities are going to survive as remnants of the past; but, as the whole of the world's additional population is going to flow into major cities, the material importance of the old-fashioned cities will decrease, while their cultural importance will have great value for us, since these cities are going to be much better to live in than the cities that will be suffering from population pressure.

The survival of values

During this period of dynamic growth for so many cities, we shall have to consider very seriously the following facts. There are economic, historic, cultural and aesthetic values already invested in our present cities. These values are at present in danger of becoming completely lost under the pressures which are accumulating in the existing urban areas. In a few decades, man, by recognizing the necessity to act in a different way in shaping the surface of this earth, is going to change his policy. By then, though, there is a great danger that all values hitherto created by thousands of years of civilization in urban form are going to be lost. Man will have lost all the examples of the urban way of life which have been created after hard effort and by trial and error through hundreds of generations. And their loss will mean a great disaster, even if man averts the death of his civilization.

At this stage we have to draw one conclusion: there is an imperative necessity to save all existing cities which contain certain values for as long as possible, until the time for the proper formation of the new world-city comes, as these cities with values are going to be very important for historical continuity and for the survival of the values of the past in the city of the future.

These dynamically growing cities will have to take two factors into account:
• How to save the values of the past.
• How to create the best values for the future.

In pursuing this policy, we shall have to make sure that we have the best solution for all five elements that will enter into the formation of the city of the future. We have to protect the natural landscape. It is high time to decide in advance which parts of the natural landscape must be saved, and to keep them open and to protect them forever by acquiring the ownership of them for the community. Man and society have to be served in the best way. This can be achieved by respecting every form created by them in the past and by the development of the new city in such a way as to serve man and not the machine. City functions have to be served in the most reasonable way. If they are functions that are directly related to human dimensions, they should follow the experience of former generations. Man has not changed the dimensions of basic things. If, on the contrary, functions are the result of ad-

ditional needs, such as commuting over distances unknown before in urban areas, then we should find the most rational solution corresponding to the new requirements and new possibilities.

Thus the form of the city to come is going to be the product of different forces: those derived from man and from human dimensions, as in the past, and those which correspond to the new dimensions imposed by the machine, which must be dynamic and be unrelated to the past, as there were no such problems and solutions in the past. This must be done with only one thing in mind: how to serve man best, and not how to expand and enlarge existing urban forms which are incommensurate in both scale and content with the forms that are now going to have to be created on a completely different scale. The coming dynamic city will be, of necessity, a combination of the city of the past and the city of the future. It will be traditional in its minor units and futuristic in its major units.

Ecumenopolis: a static world-wide city

The dimensions of the world-wide city are going to be, towards the end of the twenty-first century, the largest that will be compatible with man's survival. Certainly this is a flexible notion, based on modern technological progress. We assume that technology will continue to develop as at present; this is the only assumption on which we can imagine this earth being able to house some tens of thousands of millions of human beings. The moment will come, though, when even a technology that will allow of a much greater production of food than at present is not going to allow of any further expansion of population. There will be a limit to this because, even if we solve the problems of providing enough food, water and energy (we may take for granted a constant increase in food-production by an ever-developing technology, and also a full use of ocean water and energy sources), the population is going to reach a magnitude beyond which it should not expand. An increase beyond that magnitude would not leave enough space for the formation of a proper habitat for man, for the preservation of nature, and for the survival of open spaces in proper balance with the built-up areas of the world. At this point the population of the earth will reach its limit.

This limit, as I have already suggested, will probably be on the order of not less than 20 thousand million people and not more than 50; and for practical purposes, we can assume it to be something like 35 thousand million. As far as man can understand and imagine the future, this is the population of the world-wide city that we can expect by the end of the twenty-first century. As the city will then have attained its maximum population, and therefore its maximum physical dimensions, it will be static.

Humanity, after having lived for thousands of years in static settlements, villages and cities, and after having passed through a few centuries, four at the maximum, in dynamically growing settlements, will finally settle down in a world-wide, static, ecumenical city.

This city is already under construction. It will absorb almost all the important cities of the present, and will gradually grow out of them through their dynamic growth, as well as through the dynamic growth of the new settlements that are going to be created. It will be composed of almost all the major cities of the past and present. This city is going to expand widely over the plains and the great valleys, especially near the oceans, seas, great lakes and rivers, since the most restrictive factor in its formation will be the presence of water. Even when de-salinized water can be used economically for urban

purposes, it will be available only near the level of the oceans and lakes, so these will attract the city of the future, as the small rivers attracted primitive settlements.

The ecumenical city is going to pass through two phases. In the first phase, which has already started, it will gradually build up through the expansion of dynamically growing settlements. It will consist of dynamic parts and thus will change automatically from more primitive towards more developed forms. When it finally reaches the maximum calculable population and estimatable area, it will not expand any more, and in this phase it will undergo only those minor alterations that will be indispensable for the re-adjustment of the population, the economy, and the functions necessary for the world-wide city.

The shape of the Ecumenopolis

The city of the future is going to form a world-wide network. The centres of a higher order are going to be located mainly where the greatest concentrations of population are, i.e. in the greatest plains which have the best climate and the best water-resources. The connections between them will follow the natural lines of communication as well as some underground and submarine tunnels and the corresponding air-corridors (fig. 8).
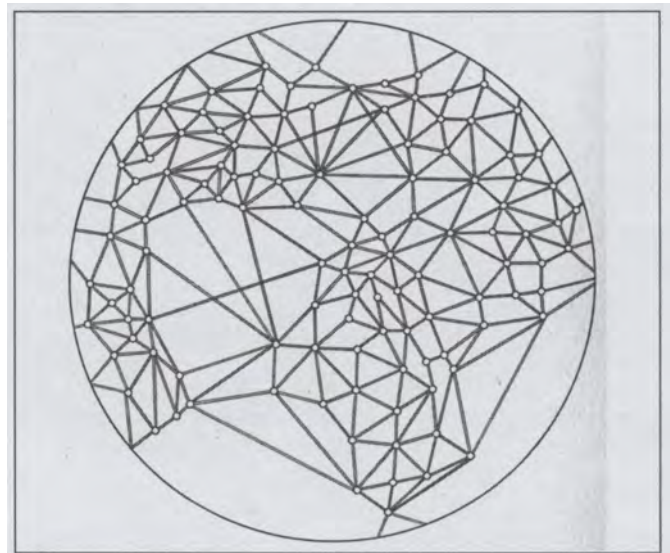
Fig. 8: The city of the future will form a worldwide network consisting of centres of several orders interconnected by settled parts of various importance.

In this network of major and minor centres, the Ecumenopolis will have a hierarchical structure of centres. The structure will range from the very small centre corresponding to present neighbourhoods, through centres of middle importance with a population corresponding to the large metropolitan areas of the present, i.e., from 5 to 10 million, to centres of the highest order with populations running to hundreds of millions. These centres are going to form networks of different orders within the major network.

Several of these centres are going to comprise all types of functions, since they will provide administration, management, transportation, culture, production and pastime for a wide area. Several others, though, are going to be specialized centres catering for special local factors or traditions. Such cities – for example, Cambridge, Massachusetts – will attract all types of educational facilities and become impor-

tant specialized centres of education of a very high order in the network of the world-wide city, while others will be important cultural, political or pleasure centres.

In this way the Ecumenopolis is going to be much more democratic in its nature than other cities of the past. The fact that it will be world-wide means that it will have no beginning and no end. It will, therefore, not have any central point that will be of much greater importance than the rest. By necessity it will lead to a much more democratic society, in which centres all round the world will be able to distinguish themselves by the type of services that they will provide, by the type of people that they will attract, and by their excellence in certain particular fields.

The notion of centrality is going to be different in the world-wide city. There will be no single central place, but a number distributed all round the world, which will be more important than the others of a lower order in their environs, but of equal importance with others not in their immediate vicinity. However, even centres in the immediate vicinity of the major centres will be able to distinguish themselves through achievements in specialized fields. There will no longer be any reason why a central area in the universal city of Africa should not be the seat of political power for at least a major African region, and why great centres of education and culture, deriving their forces from the roots of African traditions and civilizations, should not be developed near the lakes on the high plateau of eastern Africa.

Nature and the Ecumenopolis

The preservation of the natural landscape and natural elements like air and water is going to become increasingly important in the Ecumenopolis, since in many areas and in many respects we may be reaching the limits of the possible use of natural resources. What part of the natural landscape is to remain free and unencumbered with any type of construction will have to be determined by a calculation of the extent of the areas that must remain free of any man-made works in order to provide proper space for production, preservation of wild life, leisure, and the proper balance of oxygen, hydrogen and nitrogen in the atmosphere. To infringe upon any part of the natural landscape or natural resources which have not been earmarked for development in advance is something that will not be allowed (fig. 9).

The areas to be preserved will fall into several different categories. Certainly the most beautiful areas will be preserved, so that we can expect the vicinity of minor lakes, hills, mountain-sides and waterfalls to be scheduled in this category. Areas which are potentially very productive will also have to be preserved, as well as those which cannot be built on in an economic way, either because they are at high altitudes to which water cannot be lifted at an economic cost, or because they cannot be built upon at a reasonable cost.

The total natural resources which are to be preserved will be broken up into areas of different orders of magnitude,
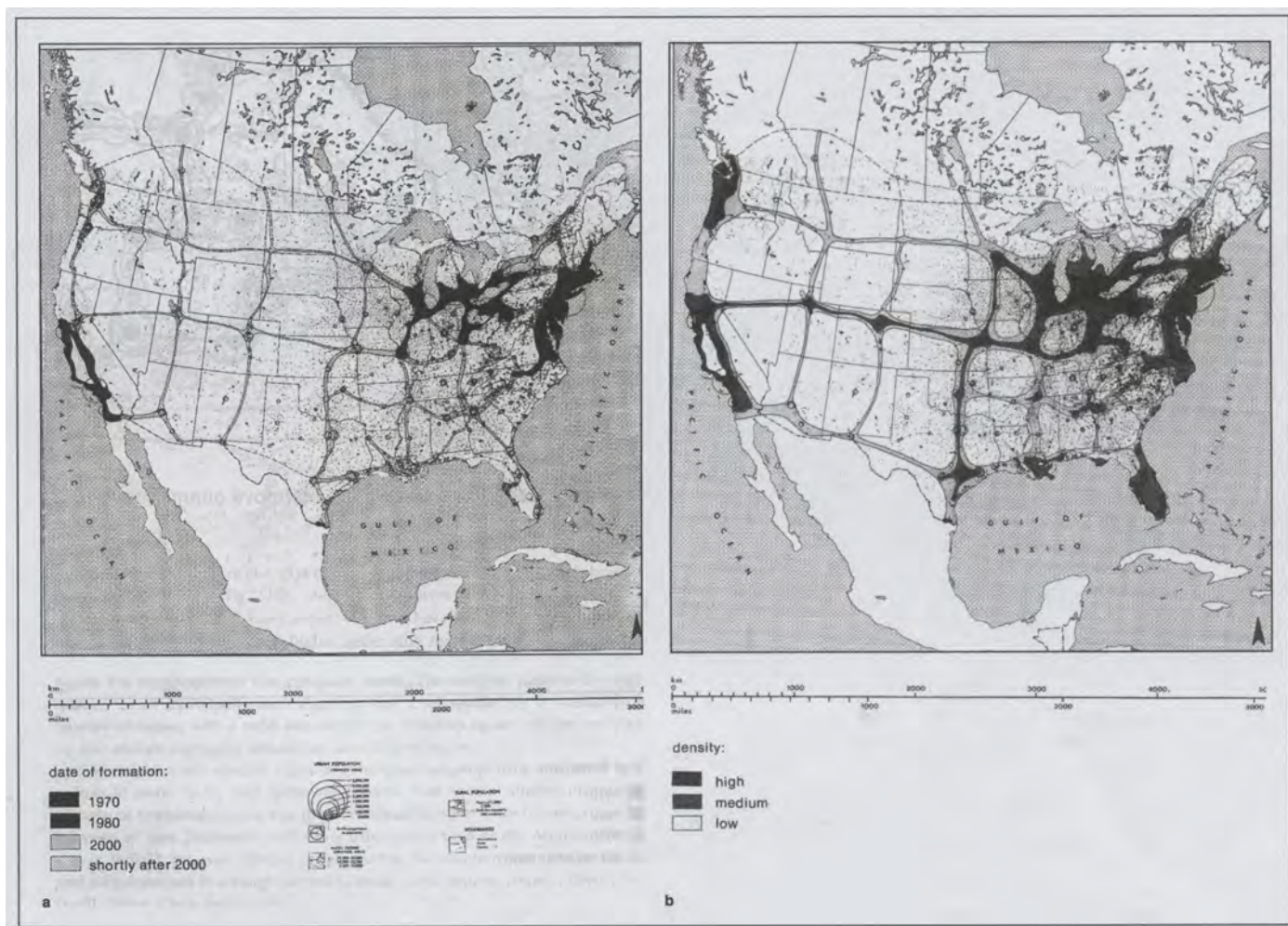
Figs. 9: Megalopolitan system in the U.S.A., 2000 (a) and Ecumenopolis in U.S.A. after 2100 (b).

varying from very big areas in deserts or in great forests to very small gardens or parks within the built-up areas.

These natural areas will either cover surfaces of different dimensions and shapes which will have a certain importance as natural areas, or they will form long strips connecting the areas of that kind, so as to allow man to move from a minor area towards a major one. As distinguished from the city of the past, which was a built-up area surrounded by natural landscapes, the natural landscapes of the future are going to be surrounded by built-up areas. But they will have to form a system of interconnected natural areas.

The natural landscapes that are to be left on the earth are not only going to be of different sizes; they are also going to be of different characters, ranging from those which will be left completely untouched by man, in order to preserve wild life to the greatest extent possible, to those which will be gradually remodelled by man, down to the decorative gardens which will try to catch the meaning of the form of the whole earth and to present it on a very small scale in a symbolic way.

The small parks and gardens will, therefore, be of different kinds according to the area in which they are laid out. In India or Pakistan, for example, they should represent all the different landscapes from which the people come: the landscapes of the Indus Valley, Bengal and Sind. In these miniature natural landscapes man will find the reflection of the major landscapes from which he derives his ancestry.

These natural landscapes should offer man all the challenges which he will have lost through the construction of the world-wide city – the challenges of the open oceans and wild mountains which man should always try to conquer. As Bertrand Russell rightly tells us, 'Man should always be given the chance to cross the oceans on rafts like the Kon-Tiki.' These challenges will also exist on a very small scale in the gardens and nurseries where children will be given a replica of nature within the dimensions of childhood in order that they may start to conquer nature on this scale with their bodies and minds. Thus, every family garden and community garden will symbolize nature, its variety, its problems and its relation to man.

Man in the Ecumenopolis

This is the most difficult problem that will have to be faced by the people who will be responsible for the construction of the city of the future. It is much easier to speak of a system of transportation, of cars and machines, than of man, the great unknown. What kind of man will inhabit the city of the future? The kind that is closer to the classical ideal, or the kind equipped with all sorts of mechanical extensions that reduce man to a manipulator of machines? I myself hope that the kind of man that is going to inhabit the ecumenical city will be much closer to the Hellenic ideal (fig. 10-14). The reason is that this is an ideal which has appealed to the majority of people

High density
Medium density
Low density

) km   500   1000   1500   200(
) miles   500   1000
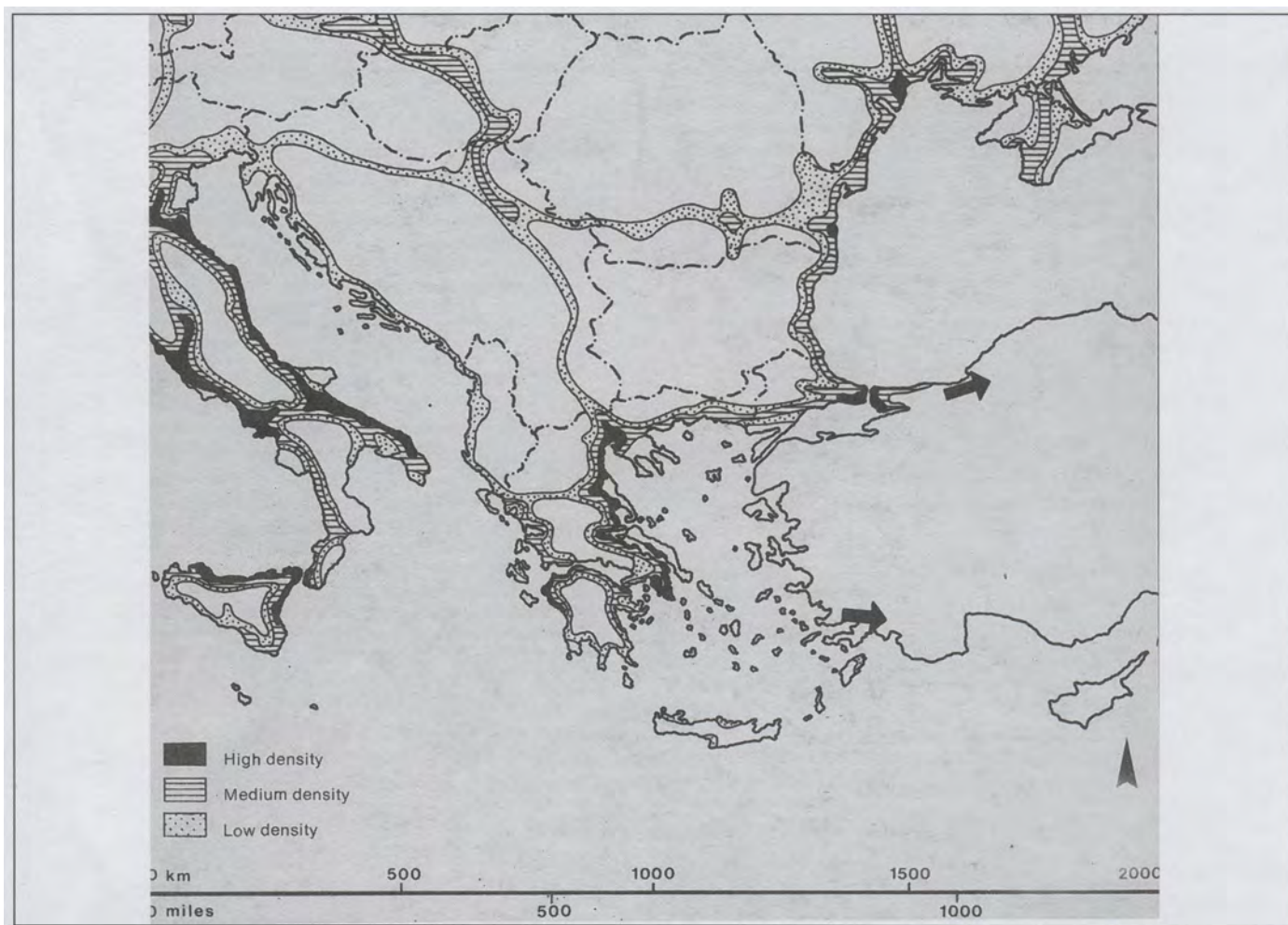
Fig. 10: Ecumenopolis in Greece, part of a first concept of Balkanopolis.

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Fig. 11: Europe – Megalopolises.
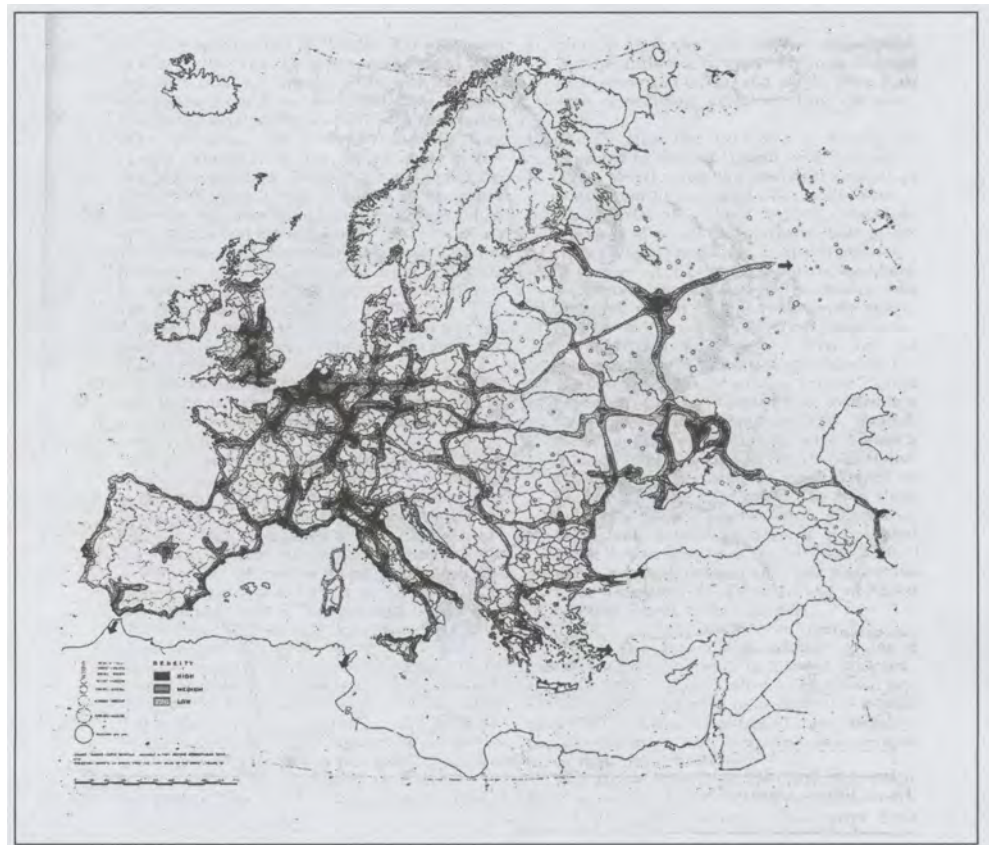
Fig. 12: Europe – Ecumenopolis in 2060 (preliminary study).
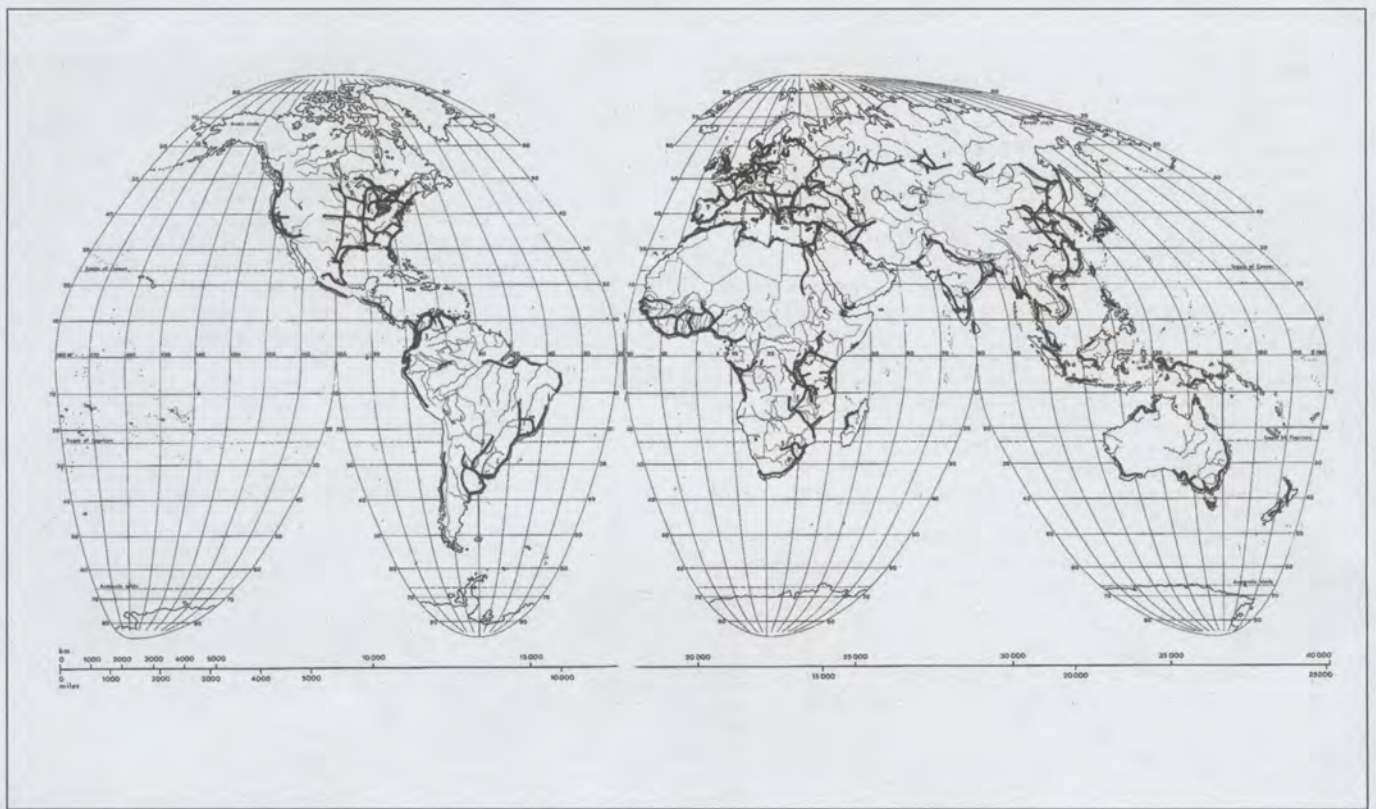
Fig. 13: Global evolution of eperopolises in the second half of the 21st century.
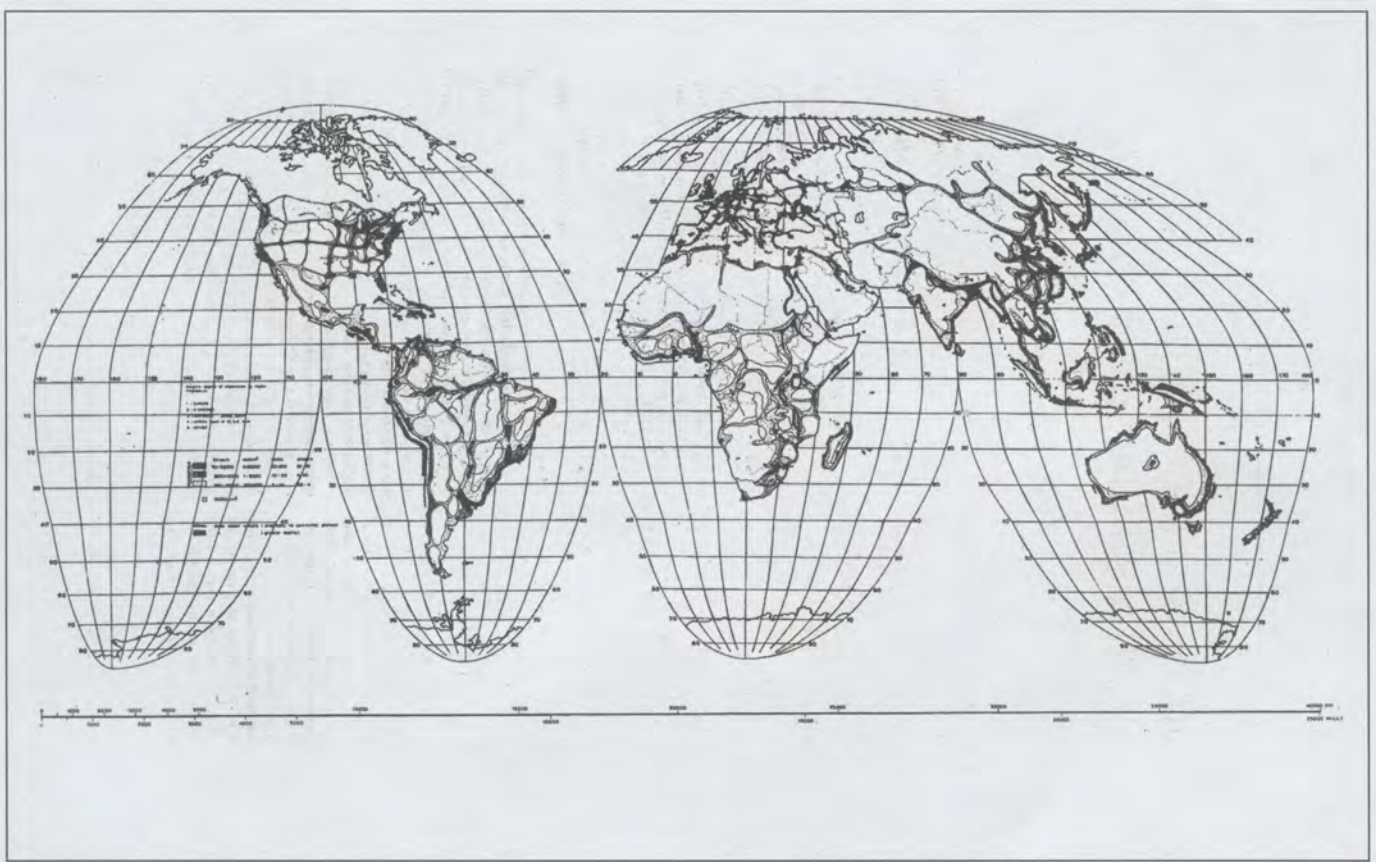
Fig. 14: Ecumenopolis in 2060.

throughout the history of man. This is natural, if we remember that the Greeks idealized, not the Greek type of man, but a universal type derived from several parts of the world. They were able to understand this universal type better, because they were living at a cross-roads of civilization and in a type of landscape and area halfway between the cold and hot climates. It is natural for us to assume this kind of man to be the typical kind for the future, since this kind comes from an environment which was preferred by man in the past – the Mediterranean and Middle Eastern environment – and which is also going to be preferred in the future, as is indicated by the present trends towards the Mediterranean, Florida, and the West Coast of the United States.

However, we certainly cannot expect that there will be only one type of man in the Ecumenopolis. On the contrary, we should allow for all types of people. If I speak of one representative type, it is because I believe that we might be tending towards a single civilization which might have several of the characteristics of the ancient Greek culture. For similar reasons, the ancient Greek culture can be taken as being representative of several ancient civilizations.

The Ecumenopolis should, however, leave opportunities open for all types of people of the present and the future. We should not predetermine man's development, we should only set the frame for it. With this in mind, we should provide for the survival of all types of natural landscape and cultural values of the past, and we should create no more than a frame for the future life of man, leaving it to him generation after generation to shape his proper habitat for himself.

If the Ecumenopolis ought not to predetermine the development of man, it also should not predetermine the development of society. The city should provide the physical shell for any type of society that may develop in the future.

As we do not know what political systems will finally survive or develop, any consideration of the city of the future should be based, not on political theories, but on dimensional considerations derived from such features and such forms as will probably remain unaltered in the city of the future. Among these then are the human dimensions, for example. As we do not expect man to double his physical size, we should always reckon with the existence of the human scale in the city. If we speak of the larger scale of the city – a scale that is no longer influenced by the physical dimensions of man and his human scale – we think of magnitudes derived from organizational considerations. Man is tending to form neighbourhoods and communities of certain dimensions which can be served best by one system of shopping-centres, irrespective of the political or social system.

In order to allow man and society to develop freely, the ecumenical city should respect the rules which are imposed by the structure of the landscape (plains and mountains, oceans and rivers), as well as those based upon the dimensions of man and the forms of organization in his social life.

Functions in the Ecumenopolis

Traffic is going to be the greatest problem of all in the Ecumenopolis. The number of the people and the amount of the goods that will have to circulate are virtually unimaginable in relation to present figures. Freedom of development will mean a much greater mobility of people; but, at the same time, these will need permanent settlements for their residence and for their places of culture and work (fig. 15). The city of the future will have new systems of transportation. The time that we spend in the most unreasonable way today is the time spent in moving about within our urban areas. We are going to need a completely different system of traffic for men and goods. This is going to be an underground system of very high-speed traffic for all types of vehicles both for mass transportation and for individual transportation.

In the city of the future both types will co-exist, and, as greater numbers of people will require individual means of transportation, the whole system is going to be based on tunnels connecting the main points of the ecumenical city. For
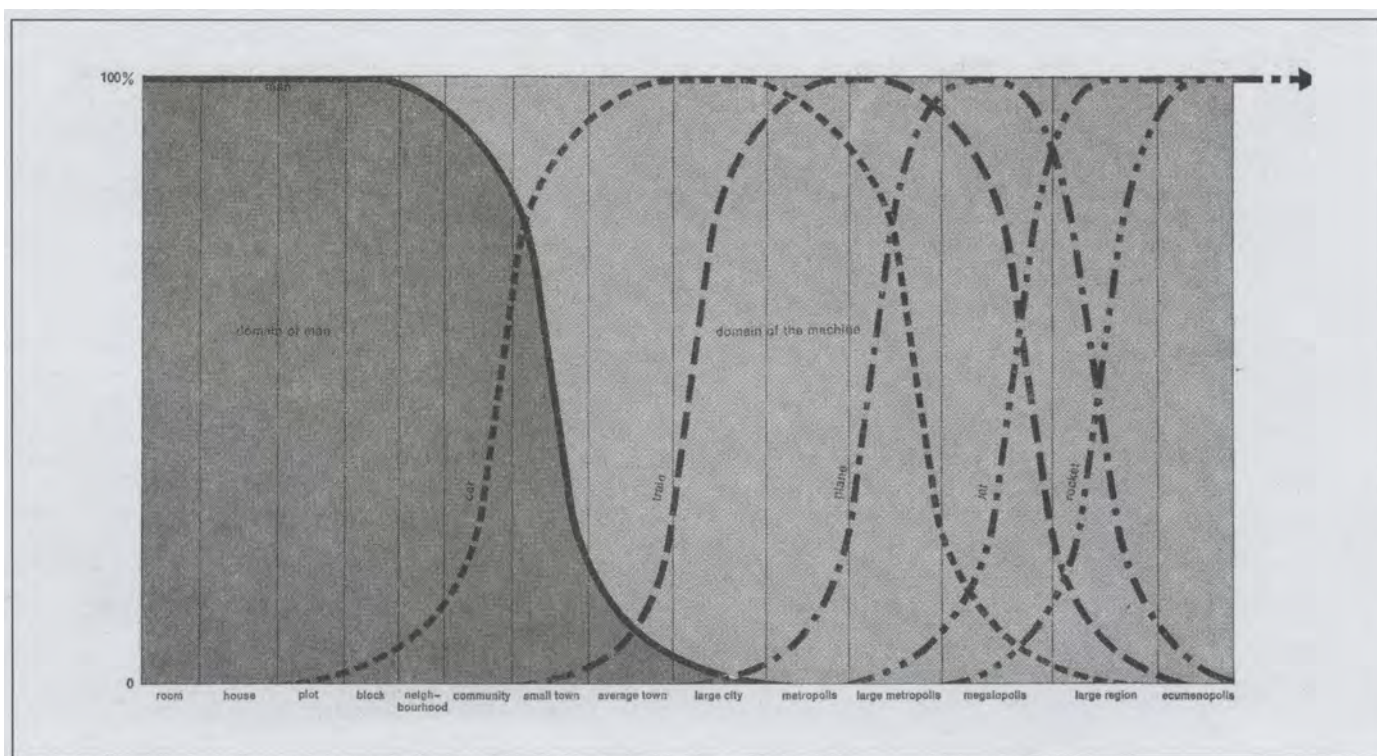
Fig. 15: The efficiency and importance of different means of transportation in relation to the Ekistic Logarithmic Scale.

the largest dimensions of all, transportation is going to be based on a system of rockets; for the very large dimensions short of that, a system of jets or their successors will be utilized. For distances of hundreds of miles, which will be of interest to the great bulk of people for their daily movement, man is going to rely on a system of radar-controlled cars in radar-controlled underground tubes, where millions of cars will move with the greatest safety at speeds of hundreds of miles an hour, allowing people, with a mere turn of the proper dial, to travel distances of miles in a few minutes and find themselves within a few hundred metres of their final destination, which they will then be able to reach by driving or walking.

If the traffic-problem is solved, then residence can be in the best locations of this world-city, as there will be no reason for people not to select the best beach or mountain or hillside for their residence, many miles away from their employment and other functions, with no fear of losing an important part of their time in sitting idle and getting nervous in long queues on the highways and at the crossroads of the city.

Places of employment are going to be of two categories. The most important will be where the white-collar workers, working with computers and automatic machines, are going to be employed. These places could be everywhere, from the small communities to the major ones, as they will be clean and will not create any noise or obstruction for the neighbourhood. This is where the bulk of the people is likely to be employed. There will also be other places of employment which will be connected with the raw materials close to the bauxite mines, where we should expect the future aluminium plants to be. These will be so automated that they will employ only a few people who will be able to commute easily by airplane from their residences. Employment connected with natural resources will be much more scattered than it is now, and much more dense in the major concentrations of urban areas.

Opportunities for leisure will always exist near residences, but also in other appropriate locations (sports, for instance, near the oceans and lakes or mountains) since the transportation problem will be reduced in importance.

Many of the functions of the city are going to be underground, exactly as our body-functions are underneath the skin. Not only are the water-supply and sewage and power-distribution and communications systems going to be underground, but the whole system of transportation of man and goods is going to be buried deep in the earth as well, in order to leave the surface for man and his buildings.

Thus, buildings which are beginning to lose importance, architecture which is beginning to be forgotten, and art which is hidden between machines or inside buildings, are all going to come out into the open.

The natural landscape that is to be preserved and remodelled in the best possible way is going to provide the proper diagram for all types of buildings. As buildings are not only utilitarian but also create the cultural environment for man, and as man should be free to develop his culture, we have every reason to believe that buildings should not be as permanent as the underground networks of water and transportation will be. They should be lighter, so that they can be changed in accordance with changes in culture and in aesthetic habits in the city of the future, whereas the city's foundations should tend to become a permanent fixture, particularly the tunnels that will form networks for all types of movements. The superstructure of the city of the future should be light and interchangeable, in order that it may be developed gradually into the most ideal habitat for man.

Is life to be tolerably human or even tolerable in this world-wide city? Is life even going to be possible in this monster city,

controlled by machines which will encompass the earth? The answer is definitely 'No' if we allow this world-wide city to expand without any respect for man, as it has been expanding up to now. It should be 'Yes', though, if we recognize the fact that this city should be built for man, and if we take into consideration the necessity of creating the proper environment for him.

This new environment is going to expand over large distances, and it will have to be traversed by mechanical means. We shall have to hop in rockets or fly and drive at speeds of hundreds and thousands of miles an hour. This, of necessity, is going to have to be done in capsules. We are already being taught to live in capsules by travelling in modern jet-planes. Man will have to adjust himself to the notion of living in two types of space – in the static space on this earth which he controls, and in the fluid space which he will be able to control only within some kind of capsule.

The basic human community

Up to what size in the Ecumenopolis can the solid space under human control be carried? The answer can only be that it will have to correspond to human dimensions. We are used to the notion that our clothes must correspond to our body. We have to learn that our rooms do not appreciably change dimension when there are changes of culture, civilization and phase. This is also true of houses. On the other hand, we saw that this will not be possible for the ecumenical city, since this will expand beyond the human scale. Where should we stop, then, in expanding our static space for man, between the Ecumenopolis, which cannot have static space because man needs fluid space here, and the house, where space, we hope, will necessarily continue to be human?

If the present trends persist, man will continue to flee into the house and will become a troglodyte. This is not right; we should expand human space as much as possible. We have to find this human space and to form it into the basic cell of the ecumenical city. The dimensions of this basic cell will be those of the human community.

Is it right, however, to build the ecumenical city out of cells consisting of human communities? Yes, if we understand that we are only creating a shell, and that this shell is going to be re-built by every successive generation that uses it. What is necessary is to accept the principle that the ecumenical city will consist of cells of human communities, and that it will find their proper dimensions. Then every generation and every type of inhabitant will give the proper shape to the community in which he is going to live. As the construction, as we have already said, is going to be light and less permanent than it is now, this is a community that can be reshaped by succeeding generations.

This must be derived from human dimensions. We are now in a position to see where we stand. A study of the ancient city has shown the point at which man has set the limits of human dimensions in the past. Corresponding studies of present-day cities, in which people are still moving freely and forming natural communities, have confirmed these findings.

There are two types of communities which have been formed since ancient times. There are those which correspond to the minimum distances that man cares to walk, within which he can find the minimum of services, and there are those which correspond to the average maximum distances that man is willing to walk, within the radius of which he can find a large number of services.

The dimensions of the minor community are up to a length of 800 metres and a width of 400-500 metres. In such communities the people would never live at a distance of more than 400 metres from the centre. Such communities are rep-

resented by the minor cities of ancient times, like Priene, and by minor present-day communities, with facilities, shops, etc., that are to be found in many contemporary cities. The major group of the human community corresponds to major cities of ancient times, like Athens, where the maximum distance in which people live from the centre is one kilometre. It also corresponds to the maximum distances covered by man in contemporary cities in search of almost all indispensable facilities.

In the light of these two considerations, we are now beginning to build communities which will form the cells of the city of the future. The basic principle in them is that man should be able to walk in order to satisfy all his needs in the community. The central part of them is the 'soft' part; there, man is in control and the space is formed with no influence of the machine. Outside, on the contrary, machines are free to run at very high speeds, using all their power, facilitating transportation and communication over longer distances.

Communities like those built in Baghdad in 1955, or like those now under construction in Eastwick, show how this principle can be implemented for lower or higher income areas, for a society with few or with many cars.

Communities like those of the University of the Punjab (fig. 16), which is now under construction, or like a major community corresponding to a small ancient city, show how the same ideas can be implemented in major institutions.

Communities like downtown Louisville, which has been approved and is going to be constructed, show how we can create human surroundings even in over-congested areas.

Finally, communities like those of Islamabad show how a whole system of major and minor communities can be created, and how, by expanding these, the system can cover wide urban areas while still allowing for the best type of metropolitan structure (proper systems of transportation, communications, facilities, etc.) with the best type of environment on a human scale.
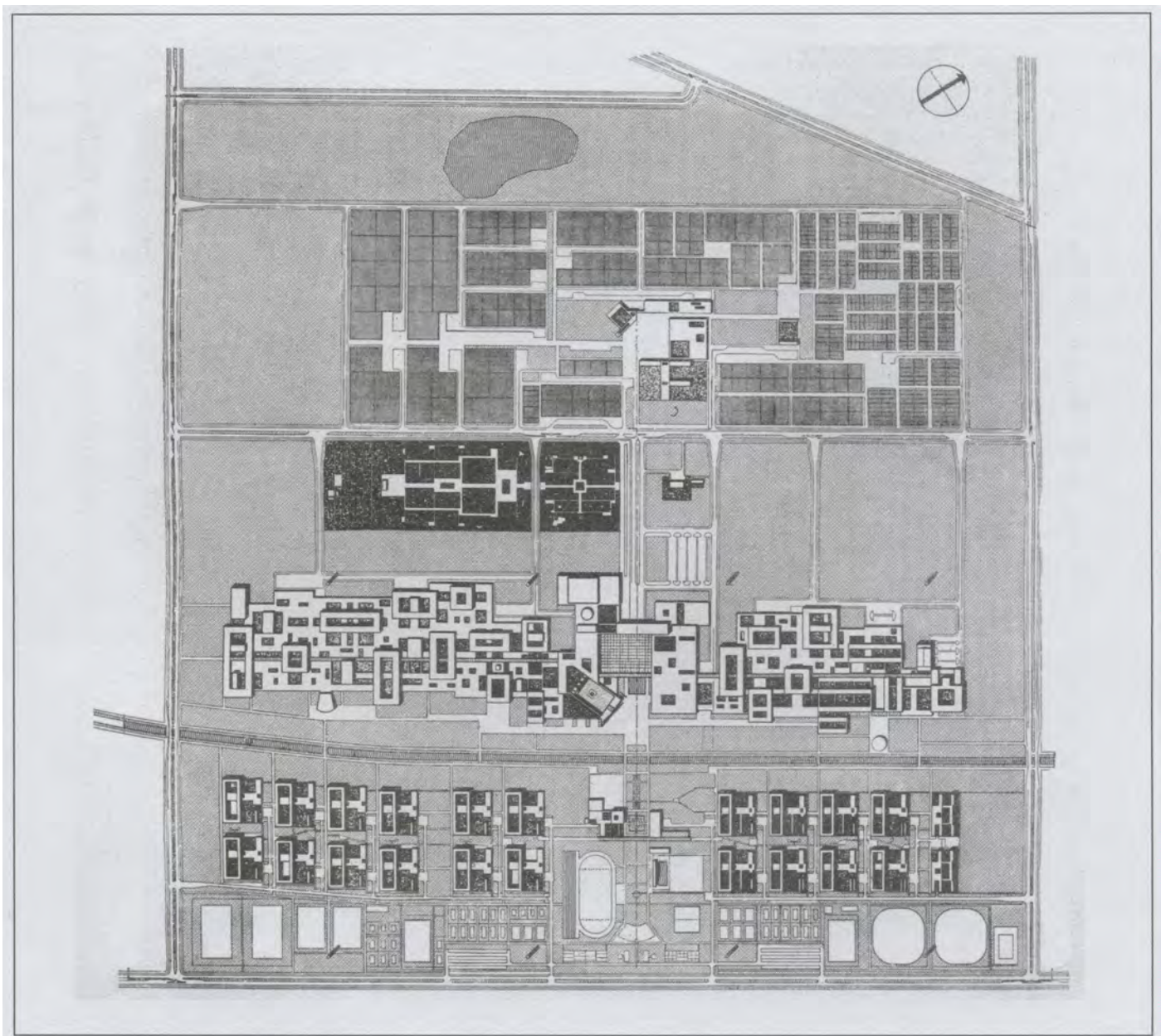
Fig. 16: General layout of the Punjab University.

A microcosm of the whole earth

The human community should be a replica of the whole surface of the earth on a human scale. It should consist of natural landscapes, either pre-existing or to be remodelled – an artificial landscape can be even more beautiful and more satisfactory than a natural one (consider the ability of the Japanese to create ideal gardens). In such a landscape, man is going to find all his opportunities for daily contact with nature. In a community of this kind, children will run free with no fear of the machine, and then will become used to growing up into being the normal citizens of the world-wide city which they will enter after the nursery age. Just as the house is still the breeding ground for babies, the human community should be (he breeding ground for infants and young children.

Man will be in control of this community. His dimensions define the dimensions of the community, his walking-capacity defines the scale, his senses define the aesthetics of the community; architecture has a meaning, and landscape and works of art again have importance, because man is in rapport with them.

The future city's natural cells

Society will find its shell in this human community. Although we shall have all types of communities in the city of the future – communities based on common interests, on education, and on the professions – the human community will give man in the city of the future the opportunity to re-establish the community of the neighbourhood. There is no reason to think that this should be eliminated, as it is being eliminated in the present-day city to the detriment of many social values.

Basic functions will be combined in the human community, as in the cities of the past. It will have its own system of transportation, based mainly on the concept of man circulating on the inner lines and machines only on the peripheral lines. It will be residential, and will have the corresponding services; it will have shopping, commercial, cultural, religious, administrative and recreational centres. It will have proper opportunities for employment (there is no reason why many places of employment, offices and small industries should not be incorporated into the human community, as they will not bother anyone) and leisure (parks, sports-grounds, etc.). Thus the major part of the needs of the inhabitants will be covered locally, so that they will have to go beyond their community only in order to find goods of a higher order. If these are available in the next community, they can walk to it by using a pedestrian bridge over the lines of transportation which, for a few more generations, are going to be on the surface of the earth before they are finally buried deep underground. If these services of a higher order are at longer distances, then man will be able to use the system of transportation that is going to allow him to travel to the other communities at a very high speed.

The form of this community will correspond, to a large degree, to the city of the past. Man will again find himself in dimensions to which he is accustomed and in which he has expressed himself for thousands of years in a certain way. He will probably follow many of the rules of the city of the past. He will emphasize public space, the small street, the squares and the central functions which will be expressed in more monumental buildings. This is an emphasis that has been obliterated lately by the invasion of the automobile.

It is in these millions of communities which will be the cells of the Ecumenopolis that man is going to re-establish democratic institutions on a very low level, by expressing his own desires, his own heart, through trial and error. In these great numbers of communities, man is going to create again the best type of habitat on a human scale. It is this habitat of man, the human community, the natural cell of the city of the future, that, by being properly interconnected with the other representatives of its kind, is going to form the texture which will cover the whole city. It is in this basic element that the life of man can be preserved and can be properly developed. This is why it is important that this community should be shaped at every phase, in every locality, by the people who are going to live in it themselves. This is the community of democratic expression and democratic life.

The city as a whole will be the result of good programming and planning, based on very careful calculations of man's needs and of the possibilities of modern technology. The universal city of the future should be, as a whole and as a frame, the product of the creative work of every able mind which can comprehend, and give shape to, the total habitat of man on this earth. The human community is the one in which the ordinary human being will find the opportunity to express himself in the best possible way.

In the past, the city plan was defined by the city authority, by the ruler. Man had the opportunity of expressing himself personally in his own architecture, by building with his own hands or by choosing his master-builder- In the future, organized society is going to take care of the universal city as a whole, and man is going to express himself in his own architecture and in his own human community. This is the great challenge for the builders of the city of the future; how to build the frame without predetermining the life of the man who is going to inhabit it. The objective is to leave him free to express himself within the best possible frame.

We are moving into the unknown. We do not know how man is going to express himself, but this is no reason why we should not build the proper frame round him. Otherwise, we shall be heading towards anarchy. We must build the frame. We must re-create the earth's skin which, in our forests, has been burnt, and in our hills has been cut away, and in our cities has been covered by a cancer. We have to build the frame of the universal city. How is man going to express himself within it? We do not know. We do not know whether he will create larger buildings, or will try to cover neighbourhoods or whole communities with a single structure, as Buckminster Fuller suggests. We only know that something like this may be dangerous, as it may gradually isolate man from the elements of nature, and this isolation may turn him into an inhabitant of the earth who is not interested in what happens outside his shell. We may have several ideas on the formation of the city of the future, but we must allow man to express himself in the best possible way according to his desires and according to the current phase of his evolution. One thing that we must not and cannot do is to allow this city to grow and to develop haphazardly, for then it will asphyxiate man. We have to foresee, imagine and develop the proper evolution, invent the right solution, and then build our city on the basis of these.

The C.A. Doxiadis Reader

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6. Glossary of selected terms

Awarding of the Tulane University honorary Doctorate of Law degree to C.A. Doxiadis, New Orleans, USA, 27 May, 1968. (*Source:* © Constantinos A. Doxiadis Archives of the Constantinos and Emma Doxiadis Foundation).

Glossary of selected terms

Accessibility model: A mathematical model for the distribution of population among sections of a study area based on the concept of accessibility. It is also referred to in the text as population distribution model.

Agglomeration economies: Economies which occur when a firm can profit by locating in close proximity to other firms, or when it is profitable for one firm to grow very large by combining many different but associated processes in a single organization.

Alternative: Refers to the alternative conceptual development patterns for the study area by the target year. It can be thought of as a point in the many-dimensional parameter space of the urban system.

Anthropics: total discipline covering the whole knowledge about Man, or the Science of Man as suggested by Alexis Carrel in *Man, the Unknown.* We need Anthropics, the science based on the wholeness of Man, *anthropos,* to help us study and develop him, since we cannot achieve this by simple coordination of his separate aspects. Term coined by the author, first used in the Delos Symposium of July 1966 and his speech delivered at the Aspen Institute for Humanistic Studies on July 29, 1966.

Anthropocosmos: world of Man as distinguished from the great world or cosmos beyond Man's reach. Term coined by the author, from the Greek words *anthropos* and *cosmos,* 'man' and 'world'; first used in his lecture at the Swarthmore College Centennial Year Celebrations in 1964, entitled *The Human Crust of the Earth.*

Basic employment: That part of total employment producing primarily for export outside a given area. It assumes a strict definition of the area of reference. Basic employment is used in this study as an attraction variable in the accessibility model for the spatial distribution of future population in the study area.

Ceiling density: An assigned maximum population density introduced in the accessibility model as an upper limit not to be exceeded in a given study unit.

Census tracts: As used by the U.S. Bureau of the Census to denote small areas into which large cities and adjacent areas have been divided for statistical purposes. Tract boundaries have been generally designed to be relatively uniform with respect to population characteristics, economic status, and living conditions. The average tract has about 4,000 residents.

Center system: A low-speed transportation system providing high capacity and designed to serve high-density multipurpose centers internally, such as major business districts, airports, universities, shopping centers.

Central Business District (CBD) of Detroit: As defined by the Detroit City Plan Commission, an area roughly bounded by the John Lodge Freeway on the west, the Chrysler Freeway on the east, the Fisher Freeway on the north, and the Detroit River on the south. It includes an area of 1.25 square miles.

Central Functions Area (CFA) of Detroit: Name given in this study to an area forming an elongated nucleus of central functions in the City of Detroit. It is bounded by the John Lodge Freeway on the west, the Chrysler Freeway on the east, the Detroit River on the south, and by Clairmount and Owen avenues north of Grand Boulevard. It includes the present CBD of Detroit, the New Center around the Fisher Building, the Wayne State University campus and the emerging new Medical Center. It covers approximately 5 square miles. It could be considered the future CBD of Detroit.

Central Region: Name given in this study to the Detroit SMSA which includes the Michigan counties of Wayne, Oakland and Macomb. It is the most important urban subregion of UDA and covers an area of about 2,000 square miles.

City of Detroit: The geographical area covered by the municipality of the City of Detroit alone.

Cluster (and Similarity) Analysis: A technique belonging to the broader class of taxonomic or classificatory methods which may be used to partition a set of n study units each characterized by q attributes into a number of clusters or groups which are internally as homogeneous as possible.

Community class: Based on a systematic classification of human communities expressed in the Ekistic Logarithmic Scale (ELS), starting from the smallest human community corresponding to only a group of dwellings (community class I) up to the largest possible community corresponding to the universal city or Ecumen-opolis (community class XII).

Community or local system: A low-speed transportation system serving travel within communities or groups of communities constituting major and somewhat self-contained parts of a metropolitan area.

Concept-Plan: An illustrative conceptual arrangement of future physical development in the various parts of UDA, based on the detailed elaboration of the selected alternative.

Continuously Increasing Dimensionality Method (C.I.D.): the process of the gradual increase of scale in the application of the I.D.E.A. method, in order to permit the introduction of more dimensions in the search for the best alternative.

Cosmospolis: the city of Cosmos (space).

Critical Area of Detroit: Name given in this study to a compact area of decline in the City of Detroit. This decline refers to population, income, and physical conditions in general. Income losses were found to correspond much better with the problem area in terms of most phenomena studied, and the Critical Area of Detroit was defined by 1960 Census Tracts that lost per capita income during 1950-1960. It occupies the middle third of the City of Detroit, that is an area of 50.7 square miles.

CRP: Community Renewal Program.

Daily Urban Systems: Daily Urban Systems correspond to major urban clusters such as UDA, within which people will be able to commute daily in the future with new and faster transportation systems as they do at present in well organized metropolitan areas.

Deepways: the whole system of underground lines of transportation for private or mass-transportation vehicles, few or many, travelling at all speeds, which is indispensable for the solution of our urban problems. Term coined by the author, first used in his studies of 1965 and 1966 and in his book *Between Dystopia and Utopia,* 1966.

Detroit Central City: The geographical area encompassed by

the cities of Detroit, Highland Park and Hamtramck.

Directional forces: Forces of attraction or repulsion that exist in or around human settlements and influence their structure, form and pattern of development.

Dual-mode vehicle: A vehicle which travels under automatic control on special guideways and under manual control on city streets.

Dynamegalopolis: a growing Megalopolis.

Dynametropolis: a metropolis which exhibits continuous growth like the Dynapolis. A Dynametropolis contains, all the phenomena that characterise a Dynapolis, only intensified in scale and complexity. In some respects Dynametropolis may, in addition to its major urban areas, contain examples of all types of settlements including agricultural and nomadic. Term coined by the author.

Dynapolis: dynamically growing 'polis' or dynamic city. The ideal Dynapolis depends on the type of city we are dealing with. Term coined by the author, and used since the early fifties in teaching and writing; used in his book *Architecture in Transition,* 1963.

Ecumenopolis: The coining city that will, together with the corresponding open land which is indispensable for man, cover the entire earth as a continuous network of urbanized areas forming a universal settlement.

Ekistic elements: The five elements which compose the human settlements: Nature, Man, Society, Shells and Networks.

Ekistic Logarithmic Scale (ELS): A classification of settlements according to their size, presented on the basis of a logarithmic scale, running from man (unit I) as the smallest unit of measurement to the whole Earth (unit 15). The Ekistic Logarithmic Scale can be presented graphically, showing area or number of people corresponding to each unit, etc., so that it can be used as a basis for the measurement and classification of many dimensions in human settlements.

Ekistics: The science of human settlements. It conceives the human settlement as a living organism having its own laws and, through the study of the evolution of human settlements from their most primitive phase to megalopolis and Ecumenopolis, develops the interdisciplinary approach necessary to solve its problems.

Ekistic unit: A classification of parts or whole human settlements, starting from unit 1 corresponding to man and ending with unit 15 corresponding to Ecumenopolis. From unit 4 which corresponds to community class I to unit 15 which corresponds to community class XII, the ekistic units coincide with the classification of human communities expressed in the Ekistic Logarithmic Scale (ELS).

Entopia: place that is practicable—that can exist. Term coined by the author, from the Greek words *en* and *topos,* 'in' and 'place'. First used in the Trinity College Lectures, Hartford, Conn., 1966, and published in his book *Between Dystopia and Utopia,* 1966. *Force-mobile:* the interplay created by all forces which act and evolve in the human settlements. A heuristic model based on the forces of attraction of functions of several classes depending on the type of problem which is faced. It is used for the evaluation and comparison of alternatives.

Eopolis: village.

Expressway: A high-speed urban road facility with partial control of access, serving conventional vehicles.

Floor Area Ratio (FAR): The ratio of total floor area of a building to its site area.

Force-mobile: The interplay created by all forces which act and evolve in the study area. A heuristic model, based on the force-mobile created by the interaction of major func-

tions, was developed and used for the evaluation of alternate locations of these functions.

Freeway: A high-speed urban or rural road facility with full control of access, serving conventional vehicles and providing an uninterrupted flow.

Friction factors: Coefficients entering the accessibility model for population distribution and the gravity model for trip distribution, and expressing the traveling habits of the inhabitants of the urban system as a function of travel time.

Functions: all types of activities within a human settlement, such as movement of people or industrial activities, research and education activities, and so forth, as distinct from *structure* such as roads and highways or an industrial zone, university campus, and so forth.

Gravity model: A transportation model for the distribution of movements among the zones of the study area. The name "gravity model" is derived because of its analogy to Newton's law of gravitational interaction.

Great Lakes megalopolis (GLM): The megalopolitan formation which is emerging around the Great Lakes of North America involving parts of the states of Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania and New York and a strip of the provinces of Ontario and Quebec contiguous with the Great Lakes and the St. Lawrence Seaway. This main part of GLM had in 1960 a population of 36 million, within an area of about 89.2 thousand square miles. It is encompassed by a secondary and an outer zone, with about 36 million inhabitants within an area of 457.6 thousand square miles, extending into the states of Minnesota, Iowa, Missouri, Kentucky, West Virginia and Vermont, in addition to covering more area of the states and provinces mentioned above.

Group centroids: A term denoting the mean values of a group of study units, for each of the variables (attributes) that have been used to classify study units into internally homogeneous groups during a cluster analysis process for the definition of the Great Lakes megalopolis.

High-speed ground transport: A future mass land transportation system based on new technological developments, expected to serve mainly regional and national travel at running speeds beyond 150 mph.

Human Community: is designed on a human scale in all its elements, with emphasis placed on the requirements of the pedestrian in design, movement, spatial dimensions, etc.; the non-human machine scale being restricted to the borders of the community.

Human scale: Derived from man and defined by his physical dimensions, senses and movements.

Ideal city: mentioned by several authors especially in relation to the physical aspects of the city and the disciplines of architecture and physical planning in distinction to Utopia which seldom refers to these aspects.

Isolation of Dimensions and Elimination of Alternatives method (IDEA): The gradual isolation of dimensions and the selection, by elimination, of the alternatives, conceived along the isolated dimensions, that satisfy certain ekistic criteria. It is an attempt to eliminate the arbitrariness in the search of the many-dimensional parameter space of the urban system for the optimum alternative.

Kinetic field: The distance man can move within a certain period by walking, by using animals or by using vehicles.

LPA: Local Public Agency.

Man: One of the five ekistic elements; the individual with his own characteristics and problems as distinct from society.

Megalopolis: A greater urbanized area resulting from the merging of metropolises and cities into one urban system. Its population is calculated in tens of millions. It is

distinct from the metropolis, either because its population exceeds ten million, in which case it also covers a vast surface area, or because it has incorporated more than one metropolis. Term used since ancient Greece when the small city of Megalopolis was created in Arcadia. Jean Gottman gave a special meaning to this ancient term in 1961 in his book *Megalopolis, the Urbanized Northeastern Seaboard of the United States,* a 20th Century Fund Study, The M.I.T. Press, Massachusetts Institute of Technology, Cambridge, Mass., 1961.

Metropolis: A major, multi-center urban area with more than 50,000 people incorporating other small settlements both urban and rural, growing dynamically to sizes as high as 10 million people. The average population of such settlements between 50,000 and 10 million inhabitants is of the order of 2.5 million, while about one half of these settlements have a population varying between 50,000 and 100,000.

Metropolitan guideway: A guideway for dual-mode vehicles when operating under automatic control. Metropolitan guideways are parts of the Metropolitan System serving medium and low intracity trips.

Metropolitan systems: A high-speed transportation system serving medium and long intracity trips, within and across the relatively compactly developed portions of a metropolitan area.

Modal split: The distribution of person trips among the conventional means, the future new transportation means or a combination of the two.

NAHRO: National Association of Housing and Redevelopment Officials.

National system: A high-speed ground transportation system serving long intercity travel along a few selected corridors of national importance.

Nature: The natural environment of man as it exists before he starts remodeling it by cultivation and construction. It provides the foundation upon which the settlement is created and the frame within which it can function.

Necropolis: a dead city.

Net residential density: It refers to dwelling units per acre corresponding to a strictly residential neighborhood which includes only residential sites as well as internal streets and playgrounds.

Networks: term with many meanings depending on the discipline concerned. Used in the present book to indicate the man-made systems which facilitate the functioning of the settlement, such as, roads, water supply networks, electricity, etc. *Shells:* term with many meanings depending on the discipline concerned. Used in the present book to indicate all types of structures which Man uses to live in or to put animals, machinery, produce, etc., in; the structures within which Man lives and carries out his different functions; the structures that cover Ekistic functions.

North American setting: The continental United States and the southern parts of Canada.

Polis: city.

Principal Component Analysis: A statistical method aiming at reducing a complex set of p interrelated variables, observed on a set of *n* study units, to a limited number of underlying basic dimensions.

Regional system: A high-speed ground transportation system serving long trips of regional character or long trips within large metropolitan areas.

Secondary employment: That part of total employment which serves primarily local needs of a given area. It is the complement of basic employment, and is also referred to as non-basic employment.

Shells: All types of structures within which man lives and carries out his various functions.

Similarity tree: A graph, often referred to as a dendrogram with a tree-like structure, showing the level at which two study units join together (fuse) to form a new group during a similarity analysis process.

Society: term with many meanings depending on the discipline concerned and also on different schools of thought. Used in the present book to indicate human society with all its characteristics, needs and problems; individuals are examined only as parts of it.

Standard Metropolitan Statistical Area (SMSA): As used by the Bureau of the Census to mean a county or a group of counties containing at least one city with 50,000 inhabitants or more and having economic and social relationships with contiguous counties of a metropolitan character. For a more detailed definition see the introduction to any of the *1960 Census of Population* reports, U.S. Bureau of the Census.

Study units or zones: Convenient subdivisions of UDA into units of study for the examination and comparison of the various phenomena and the application of mathematical models. The study units used mainly correspond to townships except for the Detroit Central City and the new major twin urban center where smaller units were defined by the future transportation grid of these areas (Fig. 414).

Texture forces: Forces that exist in human settlements, which spread around humans, animals, machines, Shells or Networks, or in an abstract way around points, lines, areas or volumes and cannot be expressed as directional forces. They influence the structure and form of settlements but mainly their density and size.

Urban Detroit Area (UDA): The study area of immediate urban influence of Detroit. It can be considered to represent the Daily Urban System of Detroit. It extends over an area with a radius of about 85 miles from the city and includes 25 counties in Michigan, 9 in Ohio and 3 in Canada. The area covered is 23,059 square miles.

Urbanized area: As used by the Bureau of the Census to mean a conurbation containing one or more central cities, with 50,000 inhabitants or more, as well as the remainder area of the urban fringe which consists either of incorporated places of at least 2,500 inhabitants or 100 housing units of unincorporated areas with a density of 1,000 inhabitants and over per square mile. For a more detailed definition see the introduction to any of the *1960 Census of Population* reports, U.S. Bureau of the Census.

Utopia: an imaginary and indefinitely remote place, a place or state of ideal perfection, especially in laws, government, and social conditions. First used by Sir Thomas More for an imaginary and ideal country in his book *Utopia,* 1516; it is a Greek word, a combination of *ou,* 'not', and *topos,* 'place', meaning no-where or no-place.

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2. C.A. Doxiadis, *The Method for the Study of the Ancient Greek Settlements* (in English or in Greek, 1972, 115 pp., 35 illus.) $27.00

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23. A. Petronotis, *Megale Polis of Arkadia* (in Greek, 1973, 448 pp., 18 illus.) $57.00

24. I. Kondis, *Lesbos and its Peraia* (in Greek, 1978, 564 pp., 63 illus.) $75.00

DOCUMENTATION REPORTS

D1. Union Catalogue of Scientific Periodicals in Greek Libraries (in English and in Greek, 1971, 790 pp.) $150.00

BOOKS BY C.A. DOXIADIS

1. *Anthropopolis, City for Human Development* (in English, 1974, 393 pp., 161 illus.) $60.00

2. *Ecumenopolis, the Inevitable City of the Future* (with John G. Papaioannou) (in English, 1974, 469 pp., 151 illus.) $75.00

3. *Building Entopia* (in English, 1975, 331 pp., 293 illus.) $60.00

4. *Action for Human Settlements* (in English, 1976, 207 pp., 77 illus.) $45.00

Note

ACE   : Athens Center of Ekistics
COF   : "City of the Future" Research Project
COG   : "Capital of Greece" Research Project
HUCO : "Human Community" Research Project

These publications, though in very limited supply, can be obtained from the Athens Center of Ekistics, 23 Strat. Syndesmou Street, 106 73 Athens, Greece. Price in US$ includes mailing cost (surface mail).

EKISTICS (modern Greek: ΟΙΚΙΣΤΙΚΗ) is derived from the ancient Greek adjective *οικιστικός*, more particularly from the neuter plural *οικιστικά* (as "physics" is derived from *φυσικά*, Aristotle). The ancient Greek adjective *οικιστικός* meant: "concerning the foundation of a house, a habitation, a city or a colony; contributing to the settling." It was derived from the noun *οικιστής*, meaning "the person who installs settlers in a place." This may be regarded as deriving indirectly from another ancient Greek noun, *οἴκισις*, meaning "building," "housing," "habitation," and especially "establishment of a colony, a settlement or a town" (already in Plato), or "filling it with new settlers": "settling," "being settled." All these words grew from the verb *οικίζω*, "to settle," and were ultimately derived from the noun *οἶκος*, "house," "home" or "habitat."

The *Shorter Oxford English Dictionary* contains a reference to an *oecist*, *oekist* or *oikist*, defining him as: "the founder of an ancient Greek ... colony." The English equivalent of *οικιστική* is *ekistics* (a noun). In addition, the adjectives *ekistic* and *ekistical*, the adverb *ekistically*, and the noun *ekistician* are now also in current use. The French equivalent is *ékistique*, the German *ökistik*, the Italian *echistica* (all feminine).